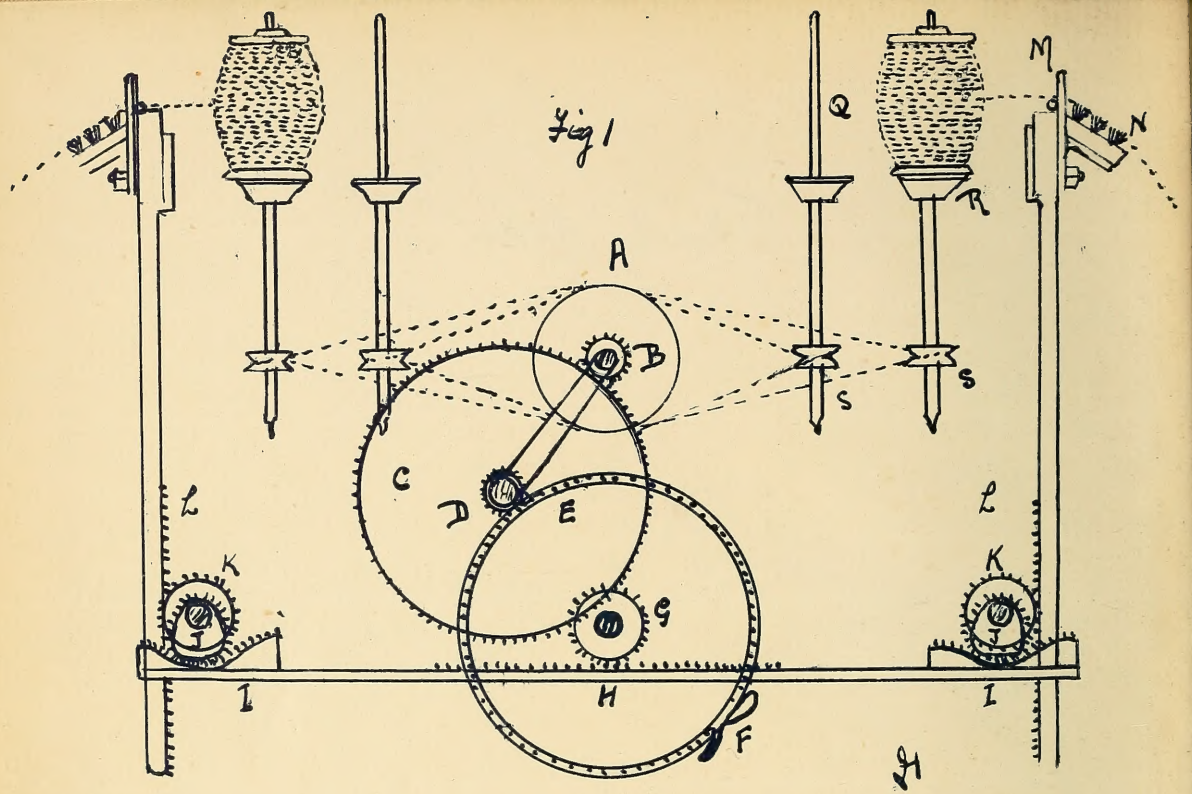
MANUSCRIPT NOTES
ON
WEAVING
BY
JAMES HOLMES, M.S.A.

THIRD YEAR.

W. A. Dyson
Nelson Main Road School

Third year



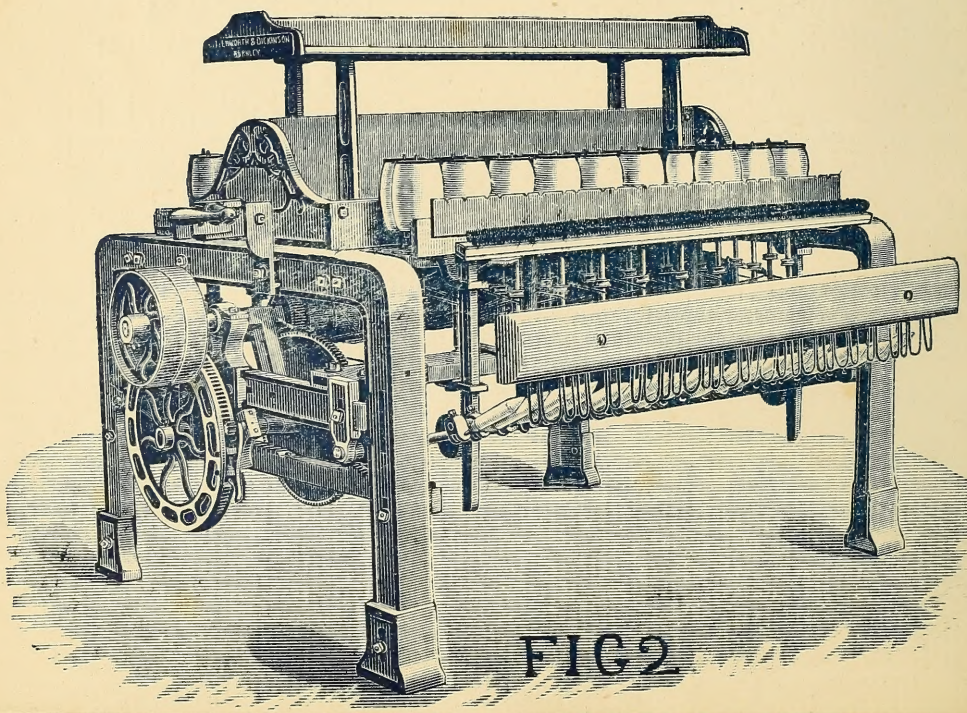


FIG 2.

Cop Winding Machine

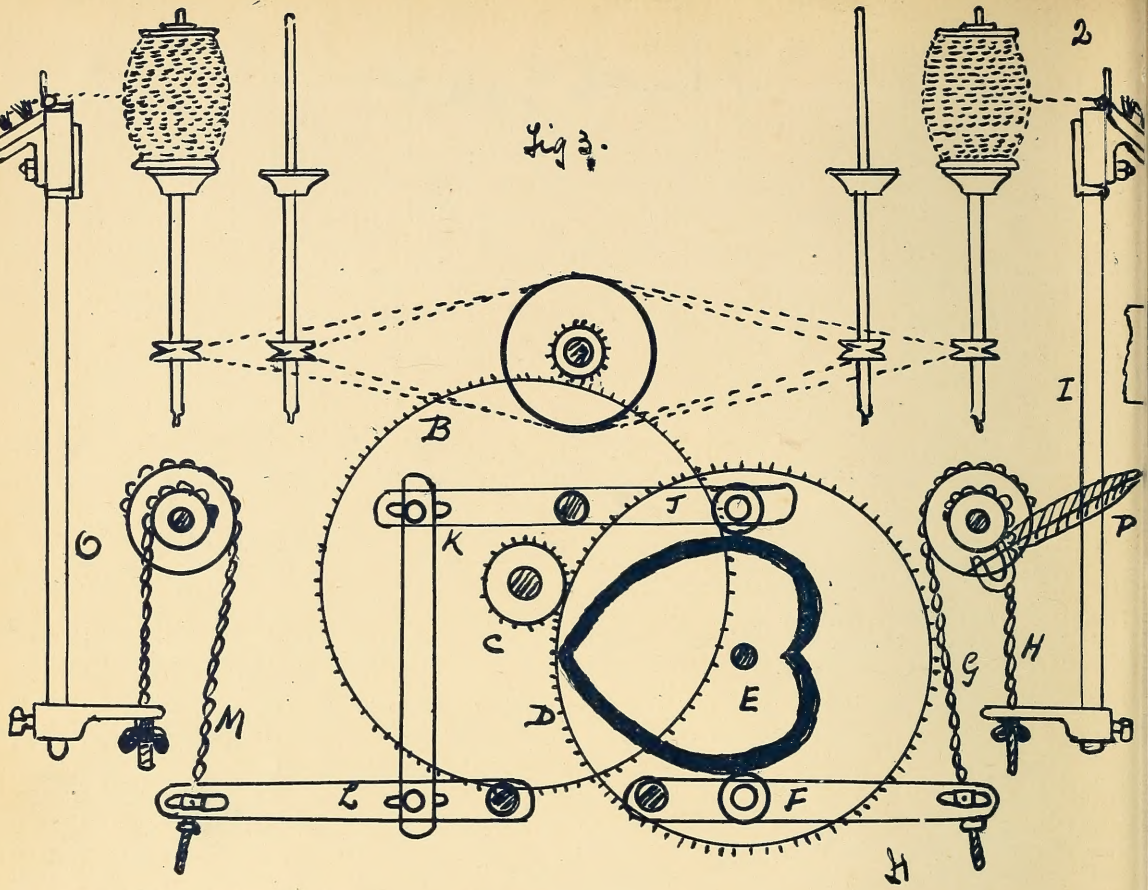
In a weaving concern the winding of the yarn from the cop on to the winders bobbins is the first process, the machine used is the winding frame, illustrated in figs 1. 2 and 3. Fig. 2 gives a generale view of the machine. Figs 1 and 3 showing more details; the principle parts of the machine are shown in fig1: it consists of a framing with a central tin roller A extending the whole length of the frame, on each side are two rows of spindles driven by means of bands from the central tin roller A; a few inches above the wharfe S around which the band passes is a braid R on which the bobbin Q rests, the cops are placed on spindles P (Fig 3). the end passes over the knee board O (Fig3) covered with flannel thence through a brush N, and a guide plate M on to the bobbin, the brush and guide plate form a traverse guiding the yarn on to the bobbin, from the bottom to the top, and from the top to the bottom. The traverse motion is worked from the tin roller shaft by means of a train of wheels, A small pinion B is fixed on the end of the tin roller shaft (Fig1) it drives C, on the same stud as C is a small pinion D which gears with and carries round the mangle wheel E; when the opening F of the mangle wheel comes opposite to the little pinion, the latter slips inside the mangle wheel and reverses its direction of motion, so that it goes once round in the direction from right to left, then once round from left to right, on the same stud as the mangle wheel is a pinion G which gears with a rack H, on the end of the rack are semicircular racks I which gear with eccentric wheels J, on the same stud as J is an ordinary wheel K of circular motion gearing with the upright rack L, having at the top the brush and guide plate which form the traverse. It has been stated that the mangle wheel goes first in one direction and then the other; the small pinion G which gears with the rack H will therefore cause the rack to move first to the right and then to the left, the semicircular rack I act on the eccentric wheels, causing them to make part of a revolution in one direction, then part of a revolution in the

The mangle wheel is well shown in fig 2.

James Forbes.

Third Year

Fig 3.



Winding from Ring Bobbins

Fig 3a

at firms where they spin their own warp yarn. the usually make the warp yarn on the Ring frame. it is stronger and better. The yarn is spun on to bobbins and the illustration shows how this is done. a number of easy running spindles A extend the length of the frame. the bobbins are placed on these. and the yarn wound from off the side and not the nose as in cop winding

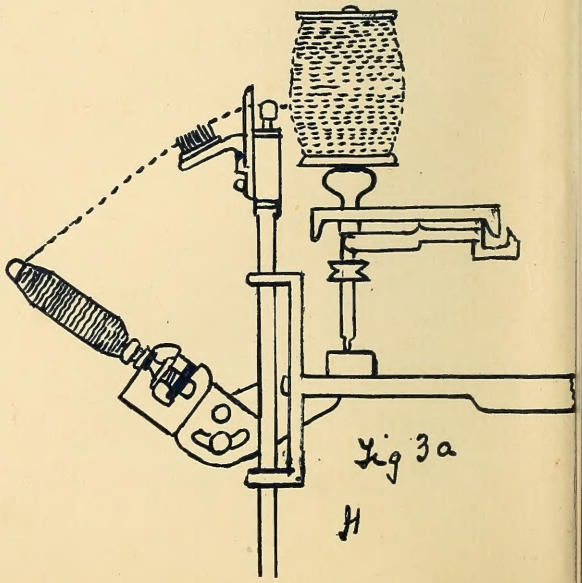


Fig 3a

H

opposite direction, the wheel K has the same motion, and as it gears with the upright rack L it causes it to rise and fall; the traverse does not move at a uniform rate from the bottom to the top, but moves quicker towards the top and the bottom and slowest at the middle, so that more yarn is wound on at the middle than at either end, the full bobbin on this account assumes a barrel shape when full, this is brought about by the semicircular rack and eccentric wheel, when the hollow part of the rack drives the larger part of the wheel it drives the wheel and therefore the rack at its slowest speed, and the yarn is at that time being wound on to the middle portion of the bobbin, but when the larger part of the rack drives the smaller part of the wheel the traverse is driven at its quickest speed this occurs at the top and the bottom of the bobbin.

Another traverse motion in common use is the heart motion illustrated in fig. 3 its action is as follows A drives B, C (is on same stud B) drives D, on the same stud as D is a heart cam E, when the full side of the cam is at the bottom it pushes down F and through the chain G and H lifts up the traverse I, as the cam slowly revolves I falls with its own weight, when the full side of the cam is at the top it lifts up J. lowering K likewise L and through the chain M N raises the traverse Q

The speed of cop winding frames is about 120 revolutions per minute

Front spindle wharves are about ¼" smaller than the wharves on the back spindles, as a bobbin fills it winds on quicker due to the increasing diameter. the winder takes the bobbins from the front row and places them on the back to maintain the same speed.

140 spindles required per 100 looms.

1 Winder per 40 spindles

James Holmes

When coloured yarn is used for weft it is usual to buy the yarn in the hank, in which form it is dyed, and then wind it on to paper or wood tubes to be used in the loom as weft.

Fig 8 gives an illustration showing a general view of the machine. Fig 9 gives a more detailed drawing of the principal parts, on each side of the machine are arranged a row of pirn cups F, and as both sides of the machine are alike a description of one side only will be given; passing round the central tin roller A which extends the length of the machine are bands, which in their turn pass round the wharves of the spindle E. The spindles E have a small hole at the top which passes right through from the top to the bottom of the spindle. fig. 10 shows an enlarged view of pirn cup and spindle. the drawing shows a section of the cup and spindle with the spindle which carries the pirn passing through the revolving spindle E; the pirn cup F builds up and gives shape to the pirn, the inside is cone shaped with an opening in front for the passage of the yarn (see fig 11). The spindle H on which the pirn is placed is loose, and is not fastened in any way to the revolving spindle E. The shape of the hole in spindle E is □, and the end of the spindle H is flattened for a few inches, by this means the spindle H is carried round and the pirn along with it. In commencing to wind a new pirn the spindle H (which has a small weight attached to the top for the purpose of giving pressure to build up a solid pirn) is provided with an empty pirn, one or two turns of yarn from the hanks S are wound on it, it is then placed in the pirn cup, the lower end of the spindle H passes into the hole of the revolving spindle E, this action carries round the spindle H and the pirn along with it winding the yarn from the hanks S on to the pirn. The yarn is guided on to the pirn through a traverse bar I over which the yarn passes, it moves through a distance equal to the depth of the cup (see fig 9) On the tin roller shaft is a pinion B driving b, on the same stud as b is a pinion D driving M and N, each of these two wheels carry heart shaped tappets O and P, resting against P is the bell crank lever V with its fulcrum at R, at the free end of the lever is the traverse bar which through the action of the tappet moves up and down guiding the yarn on to the pirn, when so much yarn is wound on to that portion of the pirn which is inside the cup, so that the cup is filled, the pirn slowly rises up out of the cup bringing up fresh surfaces on to which fresh yarn can be wound, at the same time rising out of the spindle E. by the time the pirn is completed, the spindle H will have risen so far out of the spindle E that it will no longer be in contact with it, and it stops winding

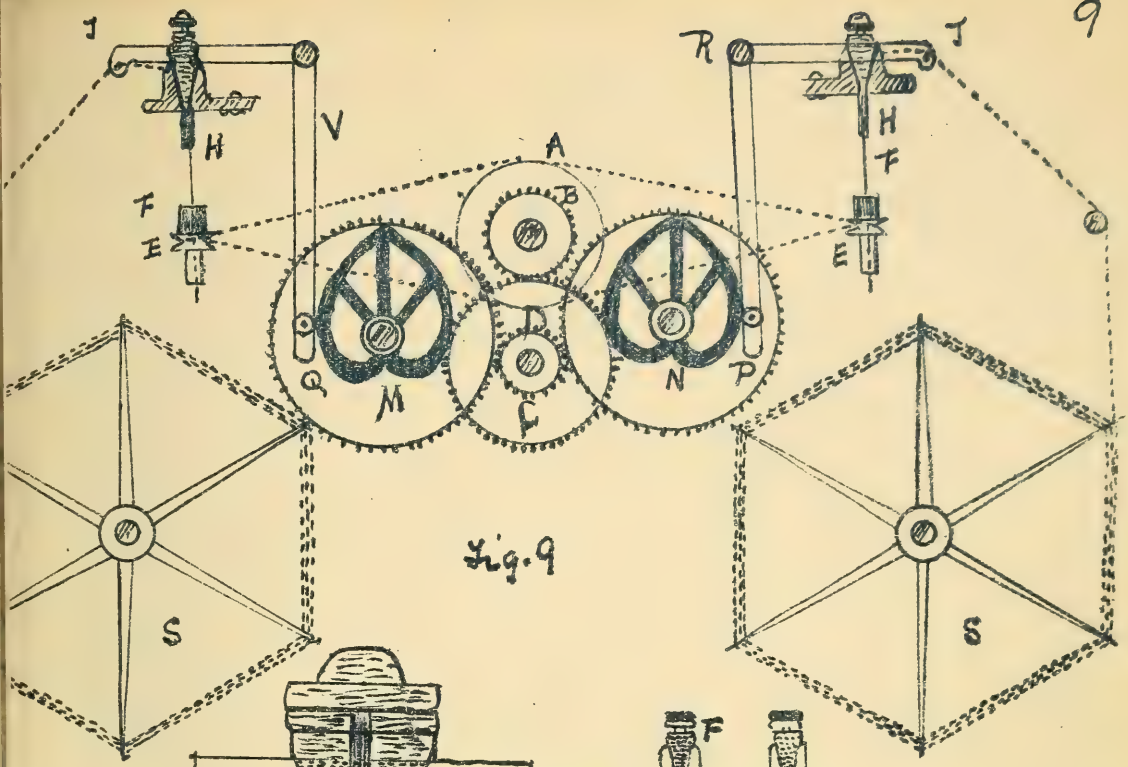


Fig. 9

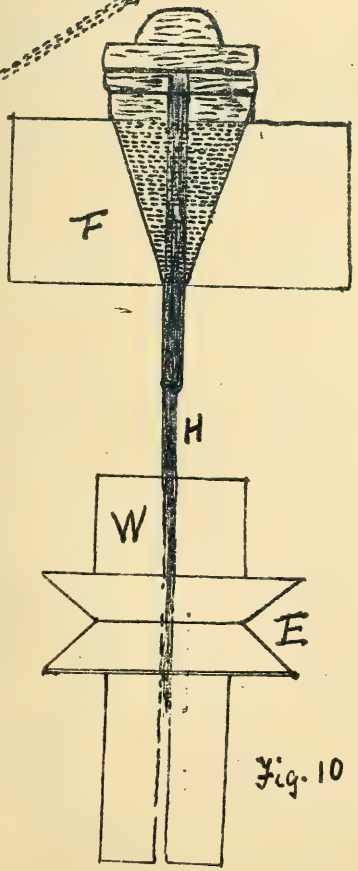


Fig. 10

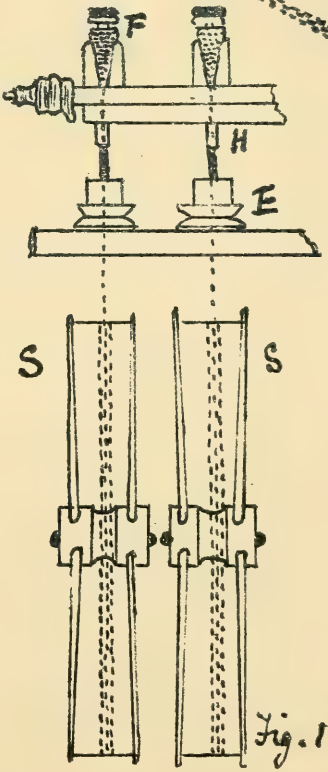
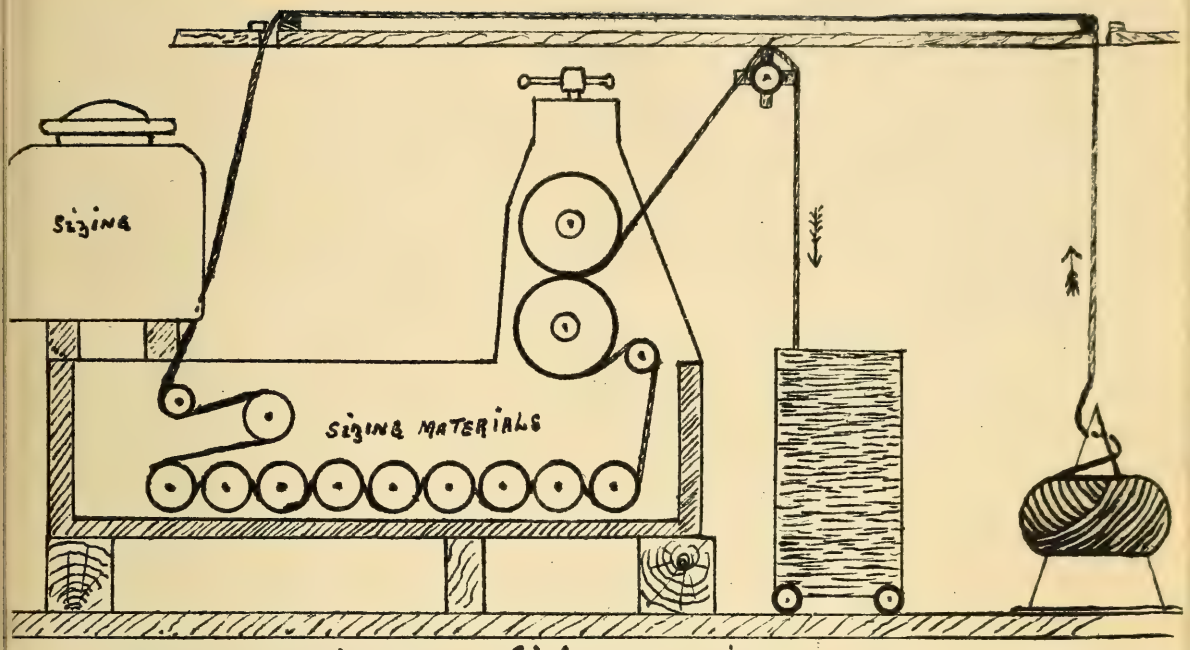
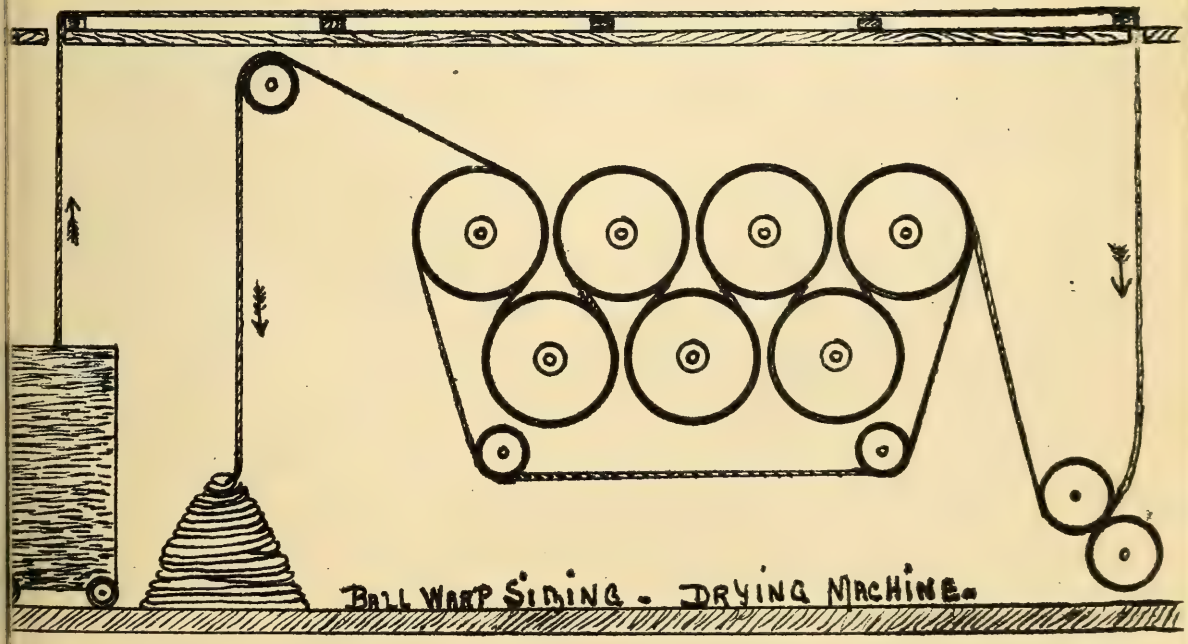


Fig. 11

BUTTERWORTH & DICKINSON
BURNLEY



Ball warp Sizing - Sizing Machine



Beaming Frame

This machine is used for winding the yarn from winders bobbins on to large back beams each of these beams are capable of holding 400 to 500 ends, each end measuring from 13000 to 17500 yds in length according to the counts of yarn used, an ordinary back beam will hold 450 ends 17500 yds. 32^s twist. A number of back beams are combined together at the slasher to obtain the required number of ends for the weavers warp, if a weavers warp of 1800 ends is required, four back beams each containing 450 ends ($4 \times 450 = 1800$) will be put up at the sizing machine. Fig 11 gives a general view of the machine, detailed drawings of the principal parts of the machine is shown in fig 12. It consists of a V shaped creel for the bobbins, the threads from the bobbins pass through a reed at S, over the measuring roller at R, beneath the roller P, over Q, under P' over Q', over the table T, through the expanding comb V over a small roller and thence to the beam, the beam rests on a large wood drum A, this drum is driven by a driving pulley fixed on the end of the drum shaft, the beam resting on the drum is driven by frictional contact, so that no matter what the size of the beam may be, whether full or empty the yarn is always coming from the bobbins at one speed namely the surface speed of the drum. The rollers P and P' are termed drop rollers, they are held up by means of the sheet of yarn passing beneath them, the axis of the rollers are not in fixed bearings but in slots which extend from the top to the bottom of the machine, when the machine is running to a stoppage the bobbins over-run themselves, and the slack yarn is taken up by one or both the drop rollers falling down the slots; in the case of a broken thread the beam is turned back to find it the drop rollers take up the slack yarn unwound from the beam, before starting the machine again the beam is pulled round by hand until the rollers are lifted to the top of the slots. Singleton's Self Stopping motion is attached to this machine, its object is to stop the machine on the breakage of a single thread, as before stated the sheet of yarn passes over the table T of the machine, this table contains three slots extending the width of the machine, beneath the table are two rollers F and G, the roller to the right hand is driven by the upright shaft L, F then drives G by means of a small pinion fixed on the end of each roller; the axis of the roller F is in a fixed bearing, the axis of the roller G passes through the lever H, the fulcrum of H is at J, each thread as it passes over the table of the machine supports a small piece of bent wire, much resembling a small hair pin, these are kept in position by the three slots; if a thread breaks the piece of bent wire (commonly called pins) it supports drops down between the two rollers F and G, the entry of the pin causes their separation, pushing

James Holmes.

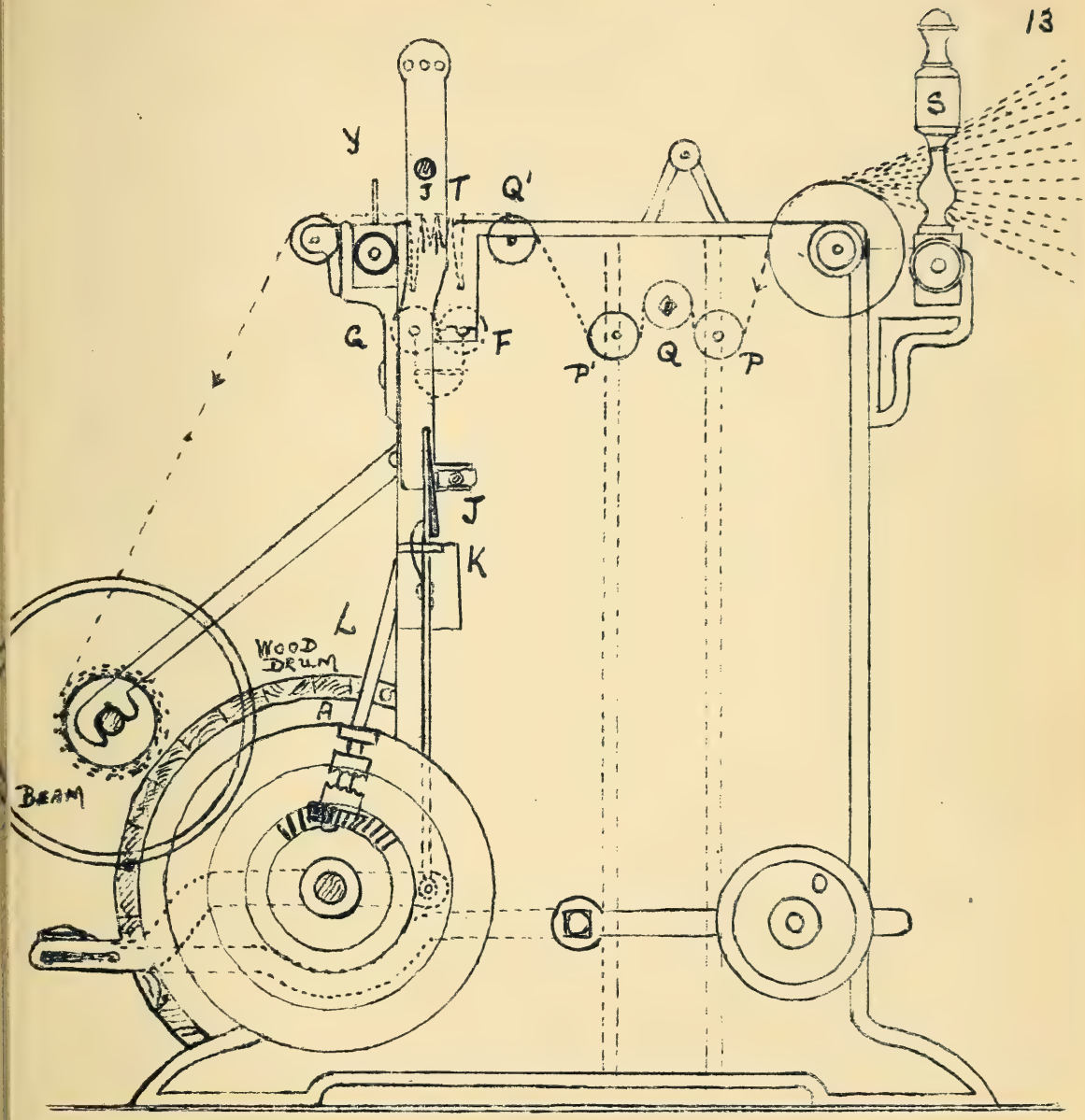


Fig. 12.

Fig. 11.

the roller G to the left carrying with it the lever H, the lower part of which is in close contact with the upright trigger J which is knocked off the support K, when this occurs the weight O which is held up by the trigger falls down, and causes the machine to stop

MEASURING MOTION. The measuring of the yarn as it is wound on to the beam is of the utmost importance. fig 13 gives a simple arrangement for measuring the yarn as it is wound on to the beam; A is a wheel 18 inches in circumference over which the yarn passes and carries it round, on the end of A is a worm B driving a worm wheel C of 70 teeth, on the same stud as C is a worm driving a worm wheel D of 100 teeth, for every revolution of D 3500 yds. which equals what is termed a wrap have passed the measuring roller. The lever arrangement E. F J. causes the machine to stop at the termination of each wrap.

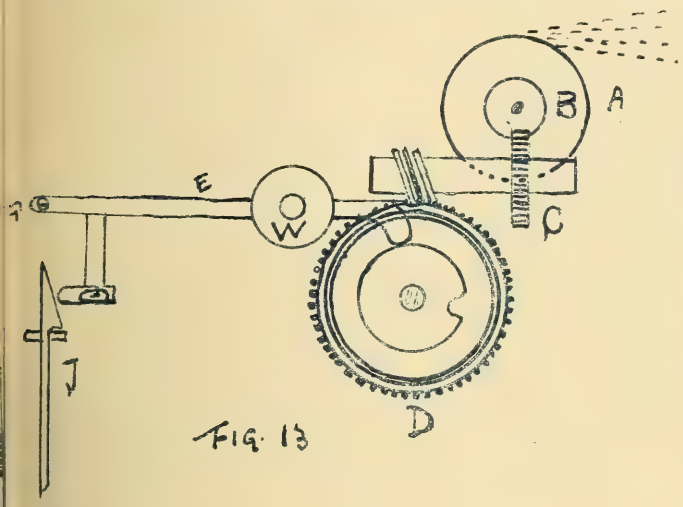


FIG. 13

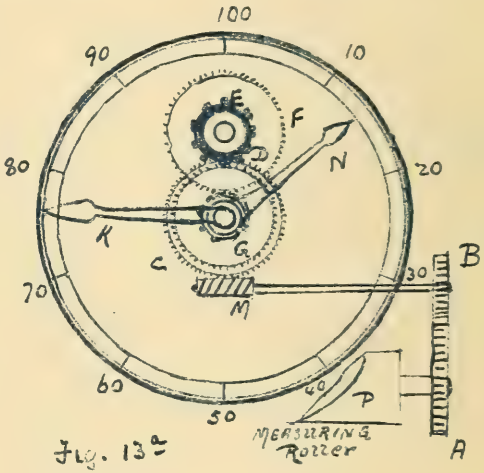


Fig. 13a

Fig 13a illustrates another form of measuring motion, a clock arrangement as shown in the Beaming frame fig. 11. On the end of the measuring roller P (18 inches in circumference) is a wheel A of 27 teeth, driving wheel B of 54 teeth, on the same stud as B is a worm M driving a wheel C of 100 teeth this wheel is fixed to the long finger K which registers yds. on the dial of the clock, one revolution of finger K = 100 yds. on the same stud as the finger K is a wheel G of 10 teeth driving a wheel F of 100 teeth, on the same stud as F is a wheel E of 10 teeth driving a wheel D of 100 teeth mounted to the same stud as D is the small finger of the clock which is driven one point for every 100 yds.

Beaming frames should be fixed on a firm floor. Speed about 40 revolutions per min. 1 Beaming frame per 100 looms for Printer cloths

James Holmes

BALL WARPING MILL

This machine is used in the grey trade when the warps are for very heavy sizing. The Beaming frame has largely superseded in the grey trade. It is still very extensively used in the preparation of warps for the coloured trade, the warps are made in the grey, afterwards dyed and sized from the ball.

Figs 14 and 15 illustrate its parts and working, fig 14 gives elevation and fig 15 plan, the same letters refer to similar parts in both illustrations. It consists of a semi-circular creel S which holds from 400 to 500 bobbins, a large circular reel or mill W about 12 feet high and from 16 to 20 yds in circumference upon which the yarn is wound spirally, situated between the reel and the creel is the beck R which serves the double purpose of keeping each thread in position and guiding the yarn on to the mill, passing up the centre of the mill is the upright shaft K and by means of tie-rods Y the mill is fixed to it. B is the driving pulley and through the bevel wheels C. D. E. F. I and J the mill is driven, fixed to the top of the shaft K is the bevel wheel L driving N, on the same shaft as N is the wheel M which works the beck up and down a distance equal to the depth of the mill. If a weavers warp of 1600 ends. 640 yds. is required, 400 bobbins are placed in the creel, the threads from these bobbins pass through the beck, which is provided with small pins with eyes at the top, one thread passes through each eye, then through the pot rail which divides the warp into half beers, through a pair of rollers fixed to upright studs, the warp is then in the form of a loose untwisted rope, a lease is taken by the beck so that each end is alternately placed, this end of the warp is then fixed to the lease pegs T at the top of the mill, the mill revolves and the beck slowly descends guiding the yarn spirally on to the mill, when 40 revolutions have been made using a 16 yds. mill $40 \times 16 = 640$ yds. have been wound on, and for convenience assume the beck has reached the bottom of the mill, a lease is taken, the yarn is turned on the lease pegs X, the shaft G is lowered so that F is in gear with H. I still remaining in gear with J by this means the direction of motion of the mill is reversed, the beck ascends at the same speed as it descended and a second layer of yarn is wound upon the first, when the top of the mill is again reached the yarn is turned on the lease pegs T the mill reversed and a third layer wound on to the second, and so on until four layers have been wound on each layer consisting of 400 ends and $40 \times 16 = 640$ yds. in length, there are 4 layers therefore $4 \times 400 = 1600$ ends, the warp therefore consists of 1600 ends 640 yds. The warp after dyeing is dressed (brushed and combed) and wound slowly and carefully on the weavers beam by the dresser James Holmes

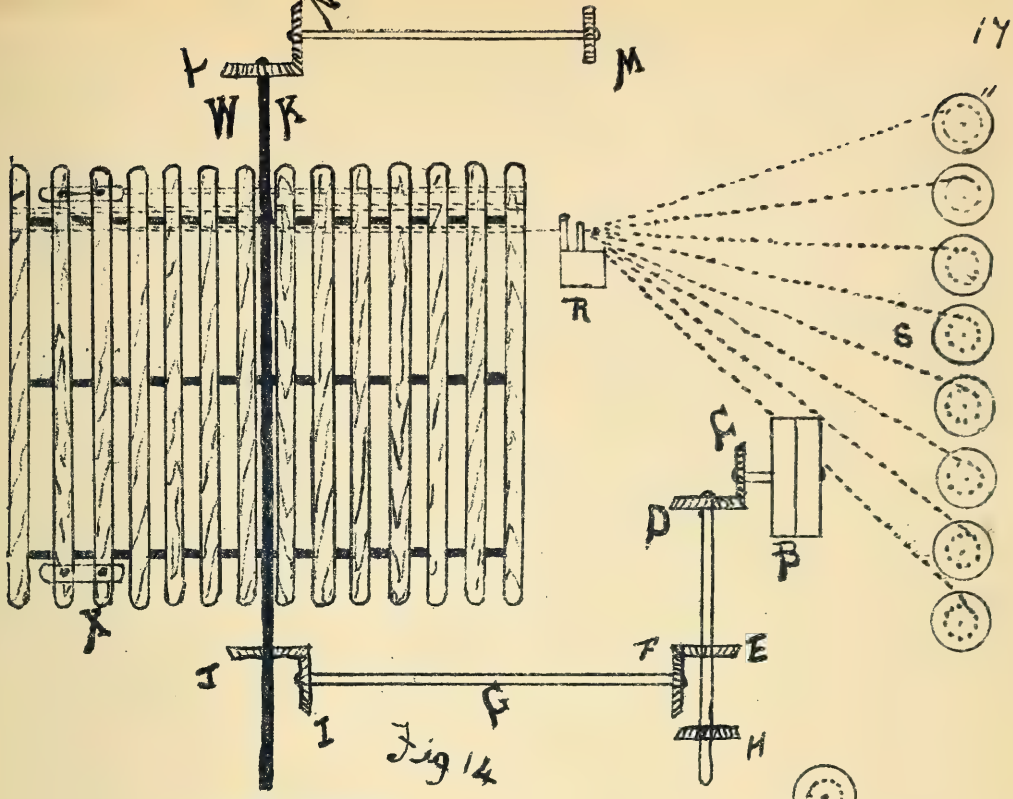


Fig 14

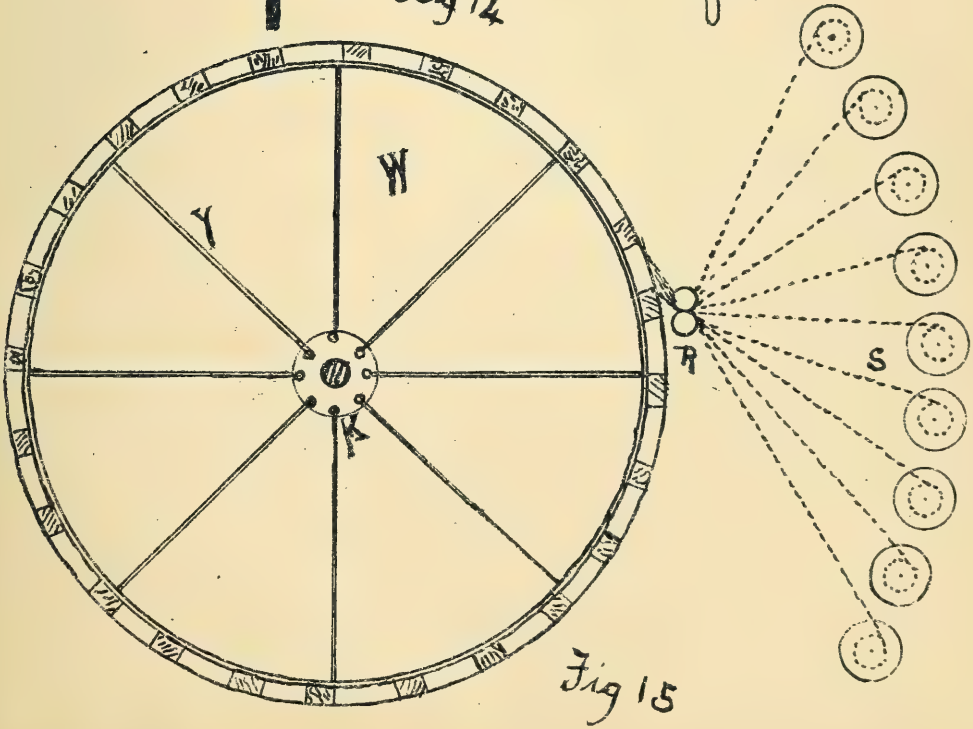


Fig 15

[illegible] the introduction of this system of warping it is necessary [illegible]
[illegible]
[illegible]
[illegible]
[illegible] the finishing process into [illegible]
[illegible] these threads woven into one warp, so many ends [illegible]
[illegible] so many ends in [illegible] pattern according to the [illegible]
required, the method is to place these ends of the warp through a reed, to keep each end in its own position, the end of the warp is then attached to the warp beam, the beam [illegible]
revolves and winds on the warp, the [illegible] meanwhile [illegible] the yarn, working the reed backward and forwards for [illegible]
[illegible]
[illegible] is still very extensively used.
For the purpose of showing one in the preparation of a warp [illegible]
[illegible]
of one of these machines, it consists of a creel for bobbins, a [illegible] arrangement, in front the back part of the machine is [illegible]
running beaming frame, in front of the machine are two [illegible]
[illegible]
[illegible] made [illegible]
the yarn from the creel is wound on to it.
If a [illegible] warp is required to be made to the following pattern [illegible]
[illegible]
are wound on to the block between the two plates until 400 [illegible]
wound on, this being a measuring motion attached to the [illegible]
[illegible] flange is [illegible]
and the section taken off, it is without flanges and is carefully placed on one side, another block is put into the machine, and another [illegible]
similar section to the 1st is made, when ready this is [illegible]
[illegible]
therefore 5 x 408 = 2040 ends, the number required in the [illegible]
[illegible]
a movable flange is afterwards placed on the other end of the [illegible]
[illegible]

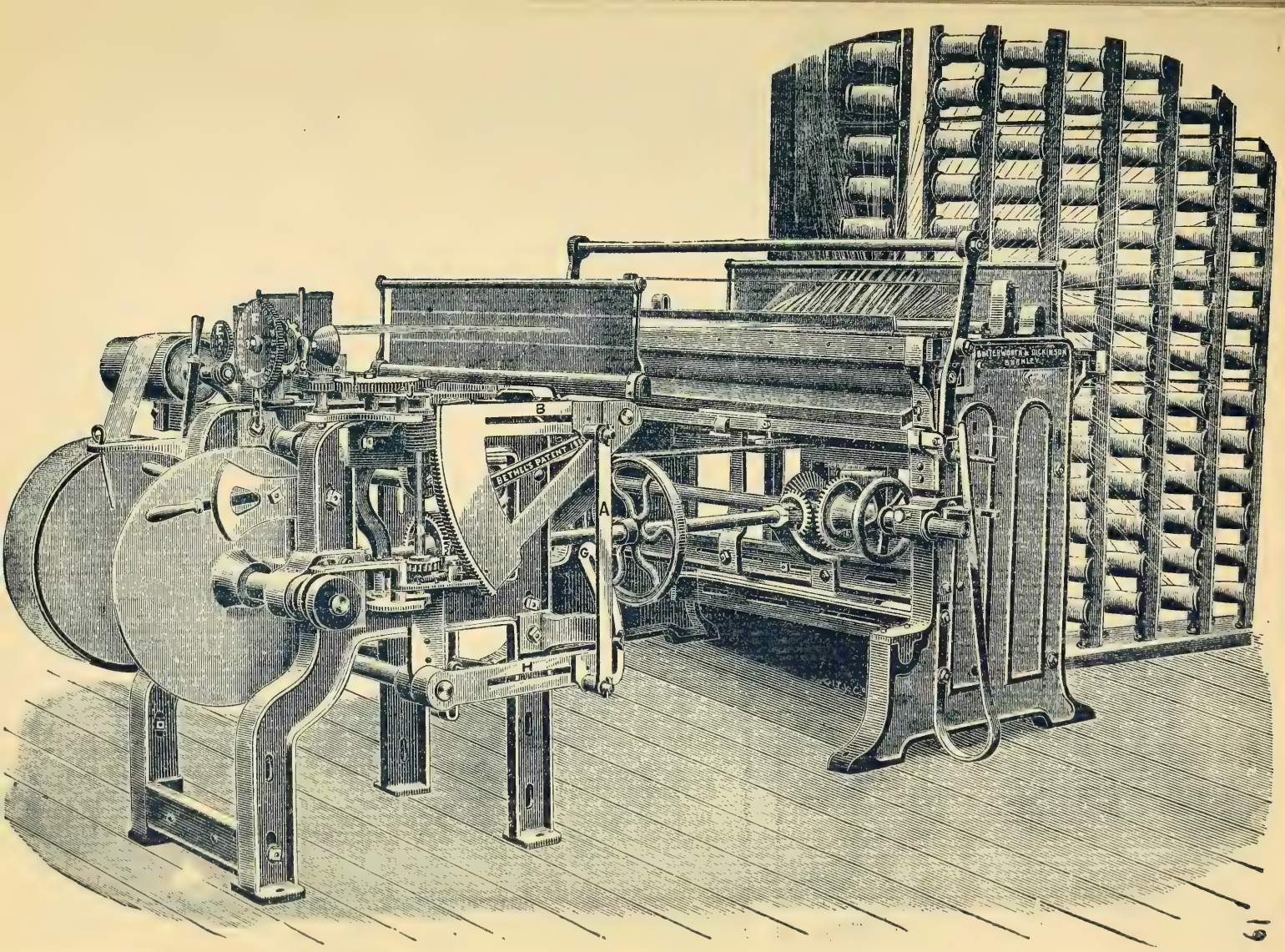
Sectional Warping

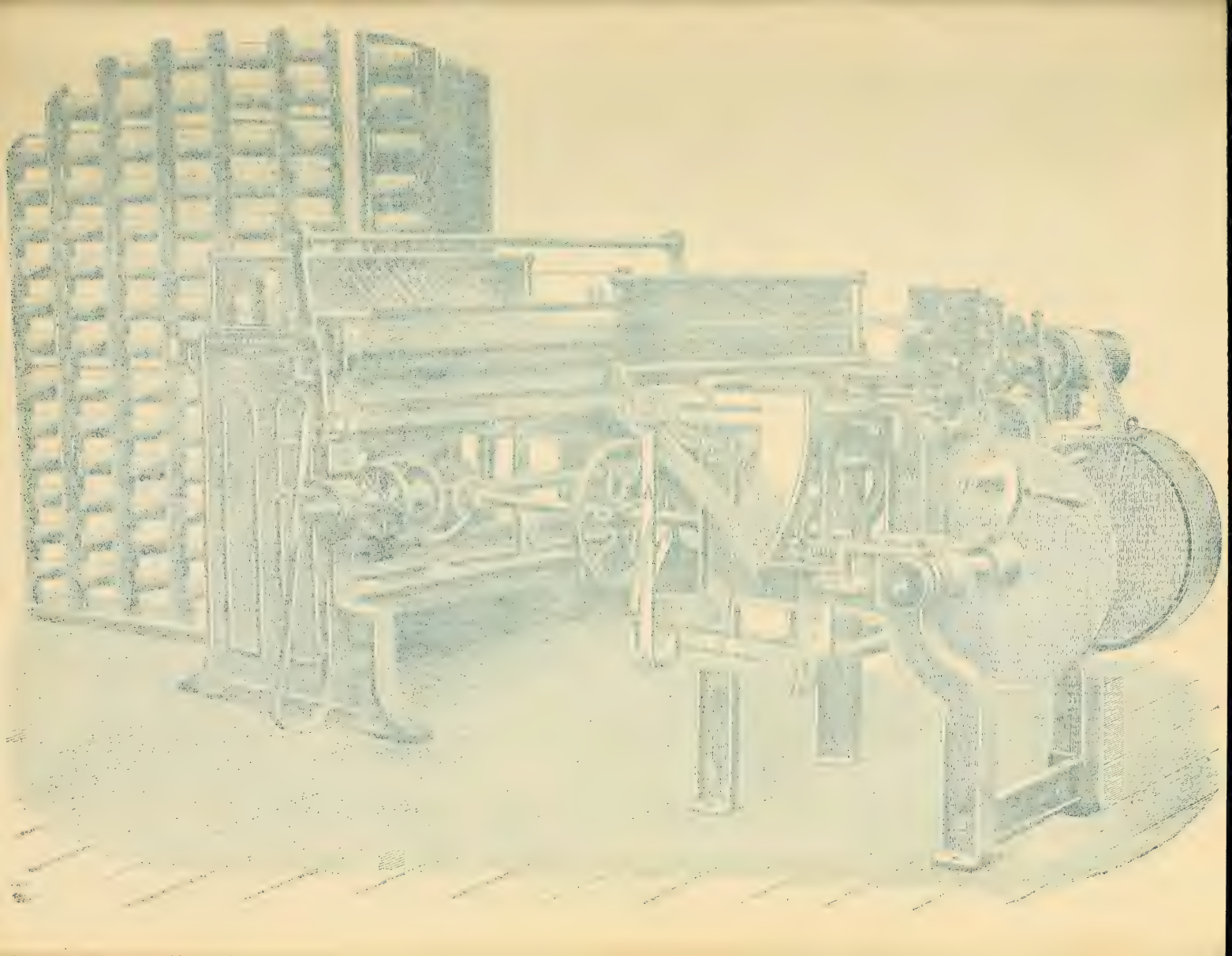
Before the introduction of this system of warping, if a weavers beam was required made up of several colours of yarn, the method adopted was to have several small warps made on the Ball Warping Mill, these warps were dyed the required colours, returned to the manufacturer and handed over to the Yorkshire Dresser, who duty consists in combining these small warps into one warp, so many ends one colour, so many ends another colour, according to the pattern required, the method is to draw the ends of the warp through a reed, to keep each end in its own position, the end of the warp is then attached to the weavers beam, the beam slowly revolves and winds on the warp, the Dresser meanwhile brushing the yarn, working the reed backward and forward for the purpose of keeping the warp straight. In Colour Weaving districts this system is still very extensively used.

For the purpose of saving time in the preparation of a mixed coloured Warp the Sectional Machine has been introduced. Fig 16 gives a general view of one of these machines, it consists of a creel for bobbins, a self-stopping arrangement, in fact the back part of the machine is similiar to an ordinary Beaming frame, in front of the machine are two circular plates, one of which is removable and a wood block about 8" dia. and 6 to 8 inches across the face is placed between them and made to revolve, the yarn from the creel is wound on to it.

If a weavers warp is required to be made to the following pattern 30 ends pink, 4 black, 10 white, 10 black, 10 white 4 black. giving 68 ends in one repeat, the weavers warp to contain 2040 ends 400 yds. one section is made consisting of 408 ends, or 6 repeats of the pattern $68 \times 6 = 408$. the bobbins are placed in the creel in the order 30 bobbins pink, 4 black 10 white, 10 black, 10 white and 4 black, this pattern is repeated in the creel 6 times, the ends from the bobbins come to the front, and are wound on to the block between the two plates until 400 yds is wound on, there being a measuring motion attached to the machine to register the length, one of the circular plates or flanges is then removed, and the section taken off, it is without flanges and is carefully placed on one side, another block is put into the machine, and another exactly similiar section to the 1st is made, when ready this is doffed and so on until 5 sections have been completed, each section contains 408 therefore $5 \times 408 = 2040$ ends, the number required in the weavers warp. These sections are then slid upon a bar having at one end a flange a movable flange is afterwards placed on the other end it then resembles a weavers beam, this is taken to a WINDING ON MACHINE for SECTIONAL WARPING which unwinds the yarn from this modified beam on to the weavers beam, after having the reed and heads attached the warp is ready for the looms. The yarn having been dyed and sized in the hank. The principle features of the machine - is the winding of the yarn so as to make all the sections the same size when the same length has been wound on

James Holme


B
A
C



This machine is in universal use in all cotton weaving districts, by its means a larger quantity of yarn can be sized and wound on to the weavers beam in a given time than by any other means. The back beams prepared at the Beaming frame are taken to this machine, where a number of beams are combined together to obtain the required number of threads for the weavers warp. A sectional view of the machine is shown in fig. 14 it consists of the following parts, CREEL, SIZE BOX, DRYING CYLINDERS, and HEADSTOCK.

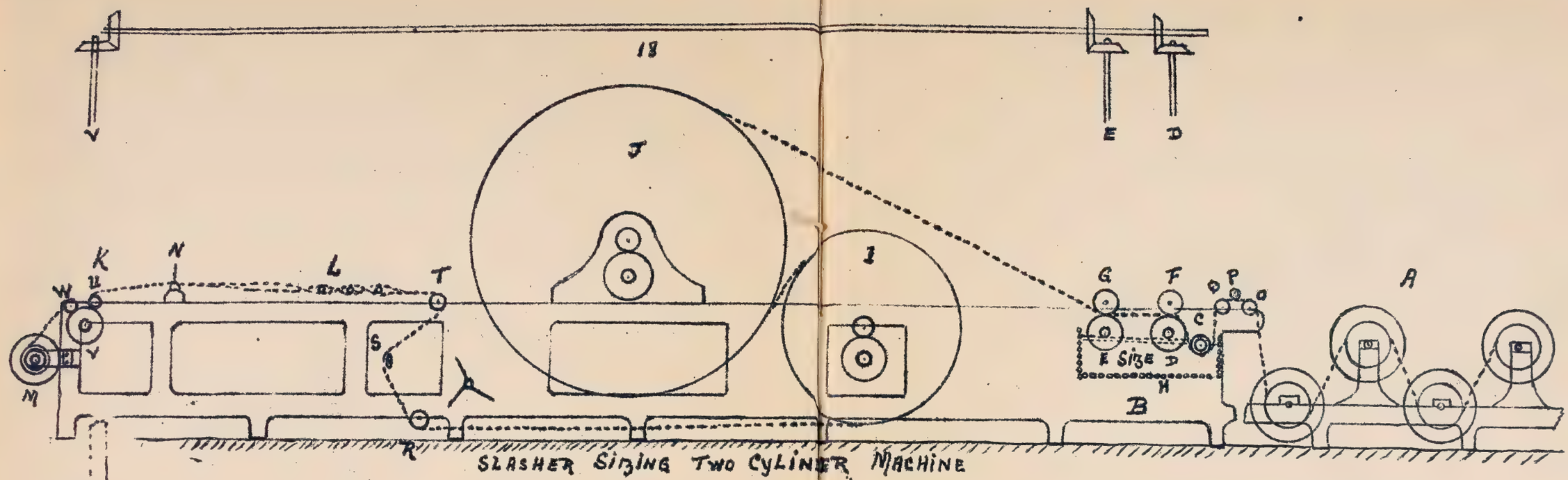
A is the CREEL for BACKBEAMS arranged so that the beams are in two levels.

B, the SIZE BOX which receives the size from the mixing beck, it contains a copper IMMERSION ROLLER C, under which the yarn passes, it can be raised or lowered by means of a rack and pinion, there are also two COPPER ROLLERS D and E on the top of each are IRON ROLLERS F and G weighing about 4 cwt. each, each roller is covered with several layers of flannel, the sheet of yarn passes between these pairs of rollers, their object is to squeeze out the superfluous size and return it to the size box; passing round the interior of the box, and resting on the bottom is a copper pipe H perforated with small holes through which the steam is forced Keeping the size at a constant boil; the Drying portion consists of two STEAM HEATED CYLINDERS I and J, the larger one is 6 ft. and the smaller one 4 ft. in diameter, both measure about 60 inches on the drying face, the interior of the cylinders are fit up with buckets to collect the water arising from the condensed steam, a steam trap is fixed to the floor near to and connected with the cylinders to carry the water away, the AXIS on which the cylinders revolve are not in fixed bearings but rest on bowls so that the cylinders are easily pulled round by the pull of the yarn which passes round them.

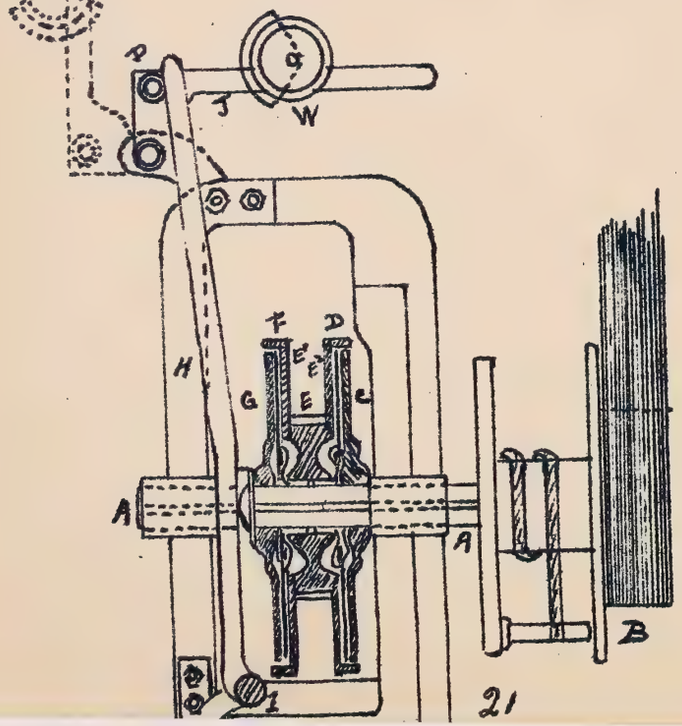
The HEADSTOCK K is the front of the machine where the yarn is seperated by the opening rods L, measured and marked the required cut lengths and wound upon the weavers beam M.

If a weavers beam is required to contain 1800 ends, 4 back beams of 450 ends each are taken and placed in the creel, the beams broadest both between the flanges are placed nearest the size box, the narrow beams behind, this arrangement prevents the sheet of yarn overlapping the flanges, the beam nearest to the size box as is placed on the lower level; the dotted line in fig. 14 shows the direction taken by the yarn, the threads from the 4th beam pass beneath the 3rd beam and collects the yarn from it, there is now a sheet of yarn of 900 ends which passes over 2nd beam collecting its ends, making a sheet of yarn of 1350 ends, which passes under the 1st beam collecting its yarn forming a sheet of yarn of 1800 ends, this passes over a small roller O under a DROP ROLLER P which takes up the slack yarn when the beams over-run themselves, over another small roller Q and into the size box, underneath the immersion roller, between the pair of squeezing rollers, over the smaller cylinder without touching it, over the larger cylinder in contact with it, leaving this cylinder at the under side it travels nearly touching the floor to the front of the cylinders, over a guide roller R, over a flexible bar S, over the roller T which guides it to the headstock, through the opening rods L, through the expanding comb N which guides it to the required width on the weavers beam, over the measuring roller U, partially round the drag roller V over the roller W and thence to the weavers beam M.

THE MAIN DRIVING of the machine is the DRAG ROLLER which pulls the yarn from the cylinder and delivers it to the weavers beam, the DRAG ROLLER is connected to the COPPER ROLLERS in the SIZE BOX through BEVEL WHEELS and a SIDE SHAFT shown in plan fig. 18, the copper rollers and the drag roller are the same diameter they pull the yarn from the creel and deliver it to the cylinders at the same speed as the drag roller pulls it from the cylinder and delivers it to the weavers beam.



SLASHER SIZING TWO CYLINDER MACHINE



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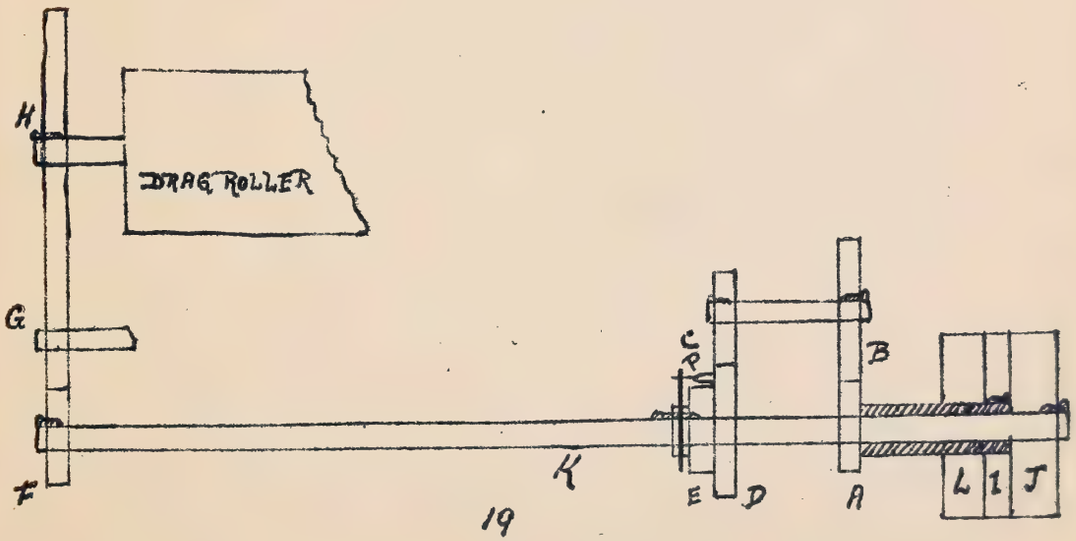
20 D



19

for the purpose of stretching the yarn, and also to keep the yarn tight on the cylinders 21 to ensure perfect drying. the drag roller is generally wrapped with several layers of cotton cloth to increase its diameter. The MACHINE IS SCARCELY EVER STOPPED after the commencement of a beam to its completion, in the event of a tapper instead of stopping the machine altogether until the attendant cuts it off, the machine is run at a reduced speed in other words it is put on the SLOW MOTION Fig. 19 illustrates the DRIVING also the SLOW MOTION J is the fast driving pulley fixed to the end of the shaft K, at the other end of K is a pinion F driving a carrier G which conveys the motion to the wheel H fixed on the end of the drag roller and as before stated this roller is the main driving of the machine, the other motions such as driving the side shaft and the weavers beam are derived from it. therefore when the driving strap is on J the machine is running at full speed. I is a thin pulley fixed to a long collar which rides loosely on the shaft K on the end of the collar is a pinion A gearing with B, on the same stud as B is a small pinion C gearing with D. the wheels A and D ride loosely on the shaft K, in close contact with D but keyed to the shaft K is the ratchet wheel E; when the driving strap is put on the pulley I the train of wheels A. B. C and D are set in motion and as small drivers A. C are driving larger drivers wheels B. D. the last wheel in the train namely D is running at a reduced speed. D rides loose on the shaft K, but the slow motion of D is communicated to the shaft K through the pawl P and flat bent spring as shown in fig. 20 which shows an end view of shaft K and wheels D and E: The loose pulley L rides loosely on the collar to which the slow motion pulley is fixed

Fig. 21 shows the arrangement for DRIVING THE WEAVERS BEAM at a DIMINISHING SPEED as it INCREASES in SIZE. the beam is driven by FRICTION at a speed just sufficient to take up the yarn as it is delivered by the drag roller. A is the shaft to which the weavers beam is fixed. C a circular plate loose on shaft A; D a circular plate covered with flannel on both sides fixed to shaft A. F a similar plate to D and like it fixed to shaft A. E a wheel with circular flanges E^1 and E^2 fixed one one each side of it they ride loosely on the shaft A: H a lever with its fulcrum at I presses against the outside plate G, J another lever with a small pin P fixed to it, the pin rests in contact with the upper part of lever H; lever J is weighted by W: the wheel E is driven positively by means of the wheel fixed on the end of the drag roller shaft, and if the plates are not pressed together the wheel rides loosely on the shaft A and no motion is conveyed to the beam, but if the plates are pressed as firmly as possible together the friction generated between the plates is so great that the flannel covered plates D and F which are fixed to the shaft are carried round almost at the same speed as the wheel E. and the beam is likewise made to revolve at the same speed as the wheel, so that by regulating the pressure on the plates the beam can be driven at any speed, short of the actual speed of wheel E: the levers H and I with the weight W are used to regulate the pressure on the plates. after the weight has been set on the lever J for a given beam it requires no further attention, though in practice many sizers move the weight slightly along the lever or turn the movable weight over when the beam is about half full, contending that by so doing a much firmer beam is made.

The PRESSER of which there are many forms, presses each layer of yarn as it is wound on to the weavers beam in close contact with the layer of yarn previously deposited

The FAN is for the purpose of cooling the yarn as it wound on to the beam.

The STARTING HANDLE is connected with a valve which shuts of the steam to the cylinders when the machine is stopped.

AIR VALVES are fixed in each cylinder to prevent collapse in case a vacuum formed

MEASURING and MARKING MOTION see Calculations in Cotton Weaving Holmes

Bell wheel 45 multiplied by Cir. of measuring Rolber } = Tin Roller wheel multiplied by Stud wheel } = by Length of mark in inches.

James Holmes

Sizing Substances

This process is the most important of all the processes connected with manufacturing, and if it be well done good results and a fair average may be expected, but if the sizing be imperfectly performed then no matter how good as class of workpeople may be employed, the results will be bad both in respect to production and quality, good yarn is spoiled and bad cloth the result. To much attention cannot be devoted to this part of the subject.

The object of sizing the yarn is to make it stronger and better able to withstand the fraying action of the reed; The substances used in a Size mixing may conveniently be placed under five heads

Adhesive Substances. Used for adhesive purposes are such as contain a large quantity of starch, as Flour, Farina, Sago, Corn Starch and many others; Flour is the most important and is always used where heavy sizing is adopted, it contains in addition to starch Gluten and Dextrine which have powerful adhesive properties, it is generally fermented before using, the products of fermentation preventing mildew: The flour is mixed with water and allowed to ferment in a seperate beck; one beck about 9 or 10 ft. long and 4 ft 6" deep and wide is seperated by a division in the centre which reaches to within about 3" from the top of the beck, two becks by this means are obtained each measuring 4 ft 6" square, agitators or Dashers which work continually, are fixed in each beck.

One method of allowing the flour to ferment and which is practiced with Success by a large firm using from 20's to 60's twist, and weaving many varities of cloth, such as plain, twills, Dobbies and Jacquards, the goods are sized for weaving only, and not for weight, is as follows—

about 3 inches of water is run into the beck, the agitators are set to work, and one sack of flour is added, a scoopfull at a time, allow this to work for one day, on the following day add two more sacks of flour in the same way, and a corresponding amount of water, So much water is used so that the mixture does not become so thick as to stop the revolving of the agitators, the day following add two more sacks of flour and more water and so on until about 7 or 8 sacks of flour are mixing in the beck. The becks must not be filled with water to within about 10" or 12" from the top, or the mixture might overflow when the flour freely ferments, but seeing that the division which seperates the two becks does not come to the top if the flour does ferment too freely it can only overflow into the other beck, after working about four or five days it will assume a density of about 30 to 34° Twaddell, if it be too thick add water, if too thin add a little more flour. The agitators are allowed to work constantly during working hours, in three weeks it is ready for use. Whilst using the flour out of one beck, another mixture is fermenting in the other beck. Other two becks are used in which the different ingredients are mixed and boiled for supplying to the Slasher. If china clay is used a seperate boiling pan is req.

FARINA is a valuable and most useful ingredient and mixed half and half with flour, along with a quantity of tallow makes a good mixing for lightly

sized goods: Care must be taken that the water used is not too hot at the time of adding the farina, or it will go into lumps and spoil the mixing.

CORN STARCH has the same properties as farina: it is quite as good, and if it be cheaper it can with safety be used in the same way and the same quantities as farina

SAGO FLOUR is used along with flour and gives good results: it is said to add a certain amount of elasticity to the yarn: it also imparts a harsh feel, but this may be overcome by using a little more flour.

GUM TRAGACANTH is valuable in heavy sizing: it is rather expensive, and only a small quantity is used: it is in the form of chips resembling horn, and before using it is allowed to stand mixed with water by that time it will have gone into a pulpy mass and is then ready for use; if required at once it is quickly prepared with hot water

BROWN SUGAR about 1 lb to each set when sizing 50s or 60s yarn will be found very good, it imparts elasticity to the yarn, and improves the weaving.

WEIGHT GIVING SUBSTANCES includes the following—

CHINA CLAY is used in all heavy mixings: it is boiled in a seperate pan along with the tallow for several hours before adding to the mixing: it should be perfectly smooth and free from gritty matter, FRENCH CHALK, SULPHATE OF MAGNESIA or EPSOM SALTS are sometimes used for giving weight

SOFTENING SUBSTANCES include the following— Tallow, Bleached Palm oil, Castor oil, Sperm oil, and Paraffin Wax: they also enable the yarn to better leave the cylinder after sizing.

TALLOW is the most important, it should be free from smell, and should not go rancid on exposure or with keeping.

BLEACHED PALM OIL is used in light sizing.

CASTOR OIL and SPERM OIL are used in heavy sizing

PARAFFIN WAX is used for giving the yarn a good finish and improving the weaving qualities, but a large quantity is objectionable it cannot be removed in the process of bleaching and scouring; if for printed cloths it does not take the colours properly but leaves white specks and blotches: it is quite a common thing in North East Lancashire if a weaver has a bad warp, to place a few wax candles between the sheet of yarn as it leaves the beam, for the purpose of improving the weaving; there is a manufacturing firm who make wax rods for this purpose.

SUBSTANCES used for giving WEIGHT and IMPROVING the WEAVING

CHLORIDE OF MAGNESIUM is the most important and is of great value if used with discretion, its value depends upon its affinity for moisture, and when used in a mixing it keeps the yarn in the most favourable condition for weaving; if too much is used the goods will be damp and liable to mildew, chloride of Zinc should be used with it to prevent mildew. It is bought in crystals & reduced to a solution of 51°T before using

GLYCERINE, GRAPE SUGAR and SOFT SOAP and SODA are occasionally used

SUBSTANCES to prevent MILDEW namely ANTISEPTICS

CHLORIDE of ZINC is generally used for this purpose, it is reduced to a solution of 92°T before using. CARBOLIC ACID is sometimes used but the smell is objectionable

James Holmes

Size Mixing

Where the Slasher is the machine used for sizing the yarn, four becks are used two for the flour and two for mixing the ingredients; this arrangement enables one of the flour becks to be used for fermenting flour whilst using out of the other one, and also whilst using the size out of one mixing beck, a fresh mixing can be made in the other one. The number of Size mixings in use for the different makes of cloth are almost innumerable.

A fair knowledge however of the different sizing substances will enable one to make a mixing for any cloth with a tolerable amount of success, but practical experience will always be the best guide.

The first thing will be to determine the amount of weight required on the yarn and then assuming that the sized yarn contains the same amount of moisture as the unsized yarn, the amount of solid matter put into the mixing will be the difference in weight between the sized and the unsized yarn, allowing a reasonable amount for loss in waste. The condensed water from the cylinders is used for mixing purposes. In sizing for a set of beams (weavers) each beam to contain 1600 ends, the total length of yarn on the back beams 17.500 yds. the sized yarn to equal 32^s twist, the unsized yarn when put up at the Slasher will equal 34^s, the rest of the weight to make it equal to 32^s will be sizing material

The unsized set weighs $\frac{17500 \times 1600}{840 \times 34} = 980$ lbs.

The sized yarn will equal $\frac{17500 \times 1600}{840 \times 32} = 1041$ lbs.

The difference between the two weights is 1041 − 980 = 61 lbs. of size.

The mixing therefore to be used for sizing the set must contain at least 61 lbs of solid matter. one method of preparing this mixing is to use a size beck about 4 ft 3" square, half fill with water then add -

Farina 28 lbs

Flour 340 lbs at 34°T reckoning ⅓ of this water it gives 113 lbs solid matter

Tallow 10 lbs

Steam boil up by blowing in steam until the mixture begins to bubble through freely shut off the steam and it is ready for use. This mixing will be sufficient to size two sets each set containing 1000 ends 17500 yds: one set is 61 lbs light or that is the difference between the unsized and the sized yarn. the amount of solid matter in the mixing may be roughly stated as follows

Farina	28 lbs
Flour	113 "
Tallow	5
	146 lbs solid matter

The flour at 34°T will contain about ⅓ of solid matter and the tallow will probably loose half its weight in water. The amount of size required to make the 34^s yarn equal to 32^s, there is in the mixing 146 lbs of solid leaving a margin of 24 lbs or 12 lbs per set which can be accounted waste. This set of warps and mixing is taken from actual practice and with slight alterations it is the method adopted in weaving

districts where Burnley printers. Sateens, twills and Jeans are woven.
another mixing for 50s twist the unsized yarn to equal 52s, but when woven into cloth it equals with the addition of size 50s

Farina 56 lb.
Sago 56 "
Flour 170 " at 34° T
Tallow 10 "

Sufficient to size two sets each 14500 yds. To be mixed as the previous set

For a Flour mixing

Flour 408 lb at 34° T
Tallow 10 "

Suitable for two sets, the sized yarn to equal 30s unsized 32s. 15000 yds.
The above mixings are for what we termed the pure Sized goods, simply sized for weaving only, another system is to add the substances and water together then twaddell to about 8 or 10 degrees. Another method is to put into the mixing solid substances equal to the weight of solid matter required in the set, then add water at the rate of 1 lb of water for every lb of yarn sized. 10 lbs of water = 1 gallon. The following mixings are based on this system and are intended to give the percentages of sizes as stated

For 10 per. cent. 2000 lbs of yarn sized

Farina 200 lbs
Wax 20 "
Water 200 gallons.

For medium Sizing say 50 per cent. 15000 lbs of yarn sized

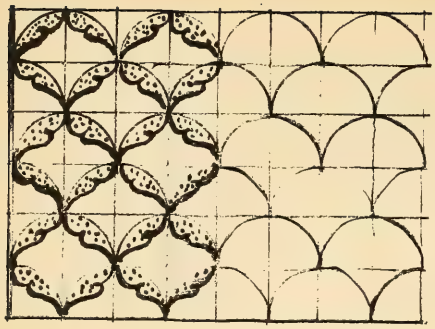
480 lbs Flour
224 " China Clay
60 " Tallow
5 gallons = (about 18 lbs) Chloride of Magnesium
2 " = (" 14 ") Chloride of Zinc.
150 gallons of water

For Heavy Sizing 100 per cent. 1400 lbs of yarn sized

560 lbs Flour
560 " China Clay
130 " Tallow
20 gallons (about 76 lbs) Chloride of magnesium
10 " (" 70 ") Chloride of Zinc.

The Hydrometer is an instrument used for measuring the density of liquids, it is generally known as a Twaddel
A Size mixing to give 25 to 50% should twaddel 15°. 50 to 100 % should twaddell 25°: 100 to 200 % should twaddel 40°

James Holmes



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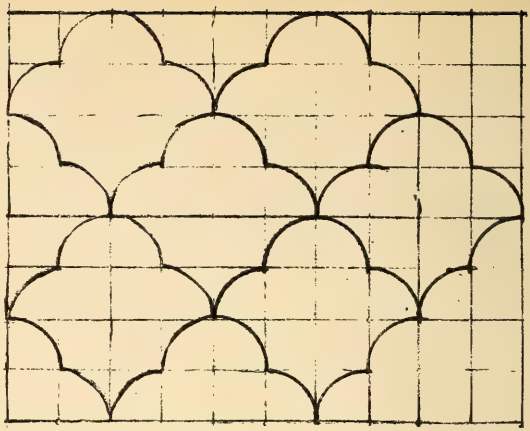

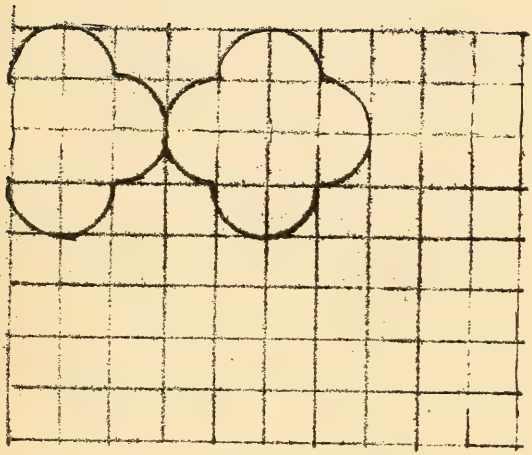

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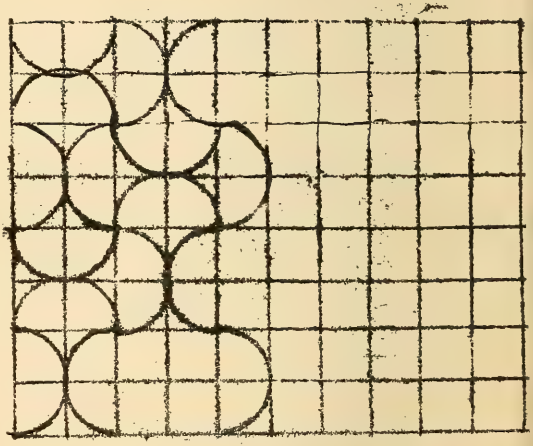

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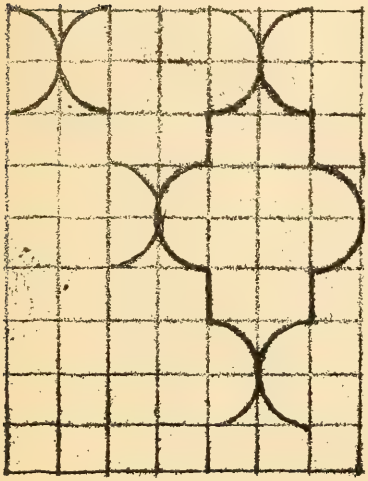

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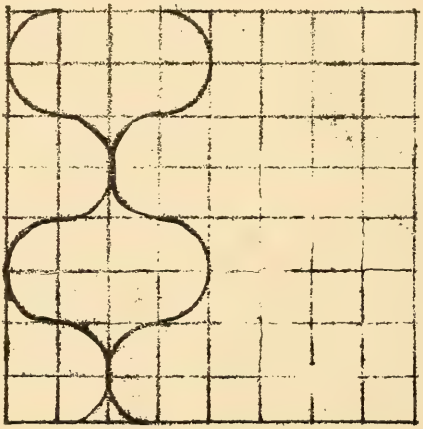


F

H

I

J

Fig 14

K

L

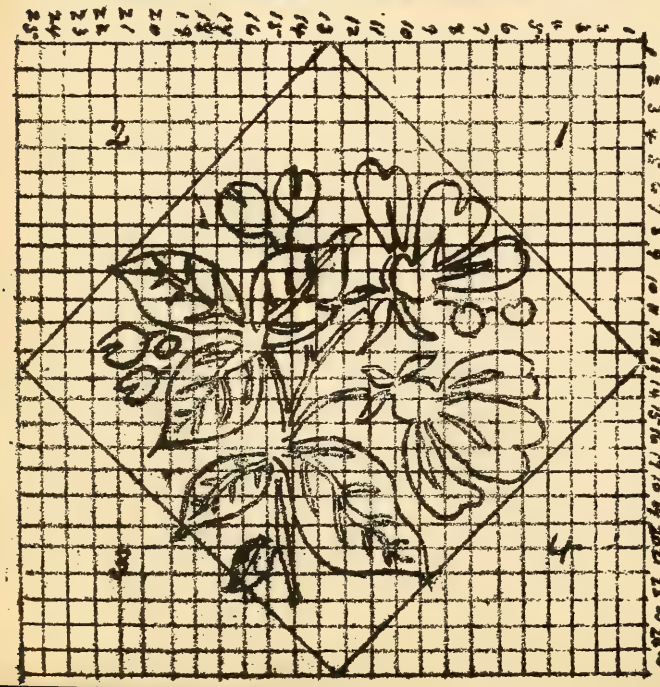


Fig 15

Fig 16

JACQUARD DESIGNING

In preparing a design for a Jacquard. the first thing to be done, is to see how the harness is tied up, and the number of hooks being in use in the machine. If the harness is a straight tie, and one suitable for an all over pattern, the number of hooks in use 200; the machine will contain 208 hooks. the first row will have no harness attached to them. Fig 12 13 illustrate patterns woven on such a machine using a 96 reed. the dotted lines gives one repeat of the pattern. the pattern = nearly 2" wide. the width cannot be altered except by altering the reed, but the length can, depending entirely upon the number of cards used.

If for a 400 Jacquard the width is nearly 4" for a 96 reed. Fig 14 gives a pattern example which gained a national award. South Lancashire

One of the simplest methods of preparing a design is to take a simple spriz pattern as shown in fig 15 and placing it in the spaces ◇ provided for it, a tracing is then made on tracing paper. fig 16. cut into for pieces, these are then transfered to the four corners of fig 14. the numbers indicating where each part will be placed. In fig 15 the pattern fills the space ◇, this is therefore the maximum size of fig that can be used, without the figures overlapping. of course any smaller figure can be used with advantage.

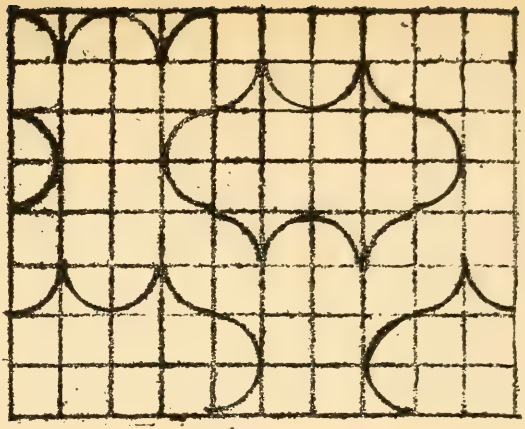
The enlargement of the design for design paper may be done freehand, or by what is known as the squaring process: this consists of ruling the sketch in 25 × 25 small squares, then then take a piece of design paper 25 × 25 large squares (= 200 ends and 200 picks) and carefully copy the sketch from the plain paper to the design paper square by square, whatever part of the figure occurs in a square of the sketch will be copied in the corresponding square on a larger scale on the design paper.

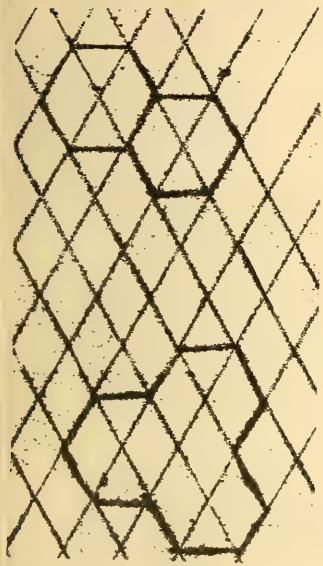
In examining a design, look for the basis on which it is made, then look for the leading lines in the design. study these in all kind of ornaments, and also the way in which they are treated, both in the way of ornament or color. make arrangements of your own, until you obtain a stock of ideas from which you can draw at any time

A. B. C. D. E. F. G are a number of geometrical forms which form the leading features in many designs, they must be completed and filled in with suitable figures. after the style of H. Fig I. J. K. L. give some idea of the kind of filling which may be used.

M. shows the making of the diamonds. but a quicker way is shown at N by using a set square of 60°, from these diamonds Hexagons and many other figures can be made. O gives a suitable figure for a design with hexagons as the leading lines. P. gives a suitable design for Leno Jacquard, complete it. the student is recommended to take a simple plant, and arrange, rearrange it in different ways, repeating by the aid of tracing and carbon paper, until he feels to have gained confidence in the work

James Holmes.





N

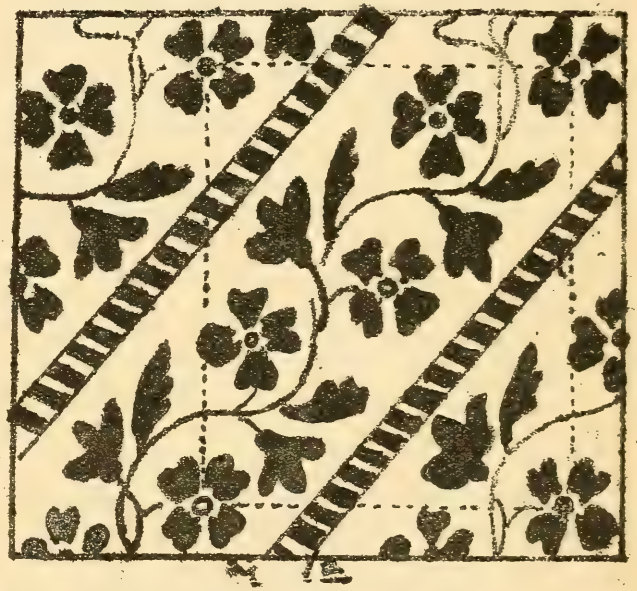
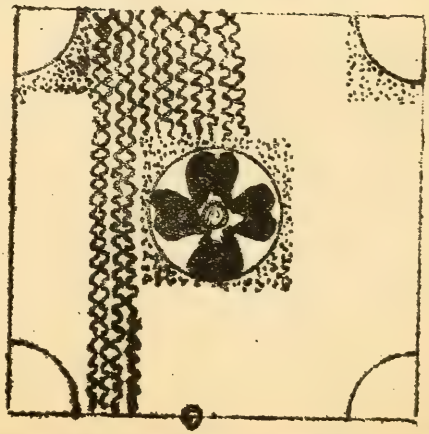


Fig. 13



O

Fill in the whole of the weave for the body of the cloth. &c.

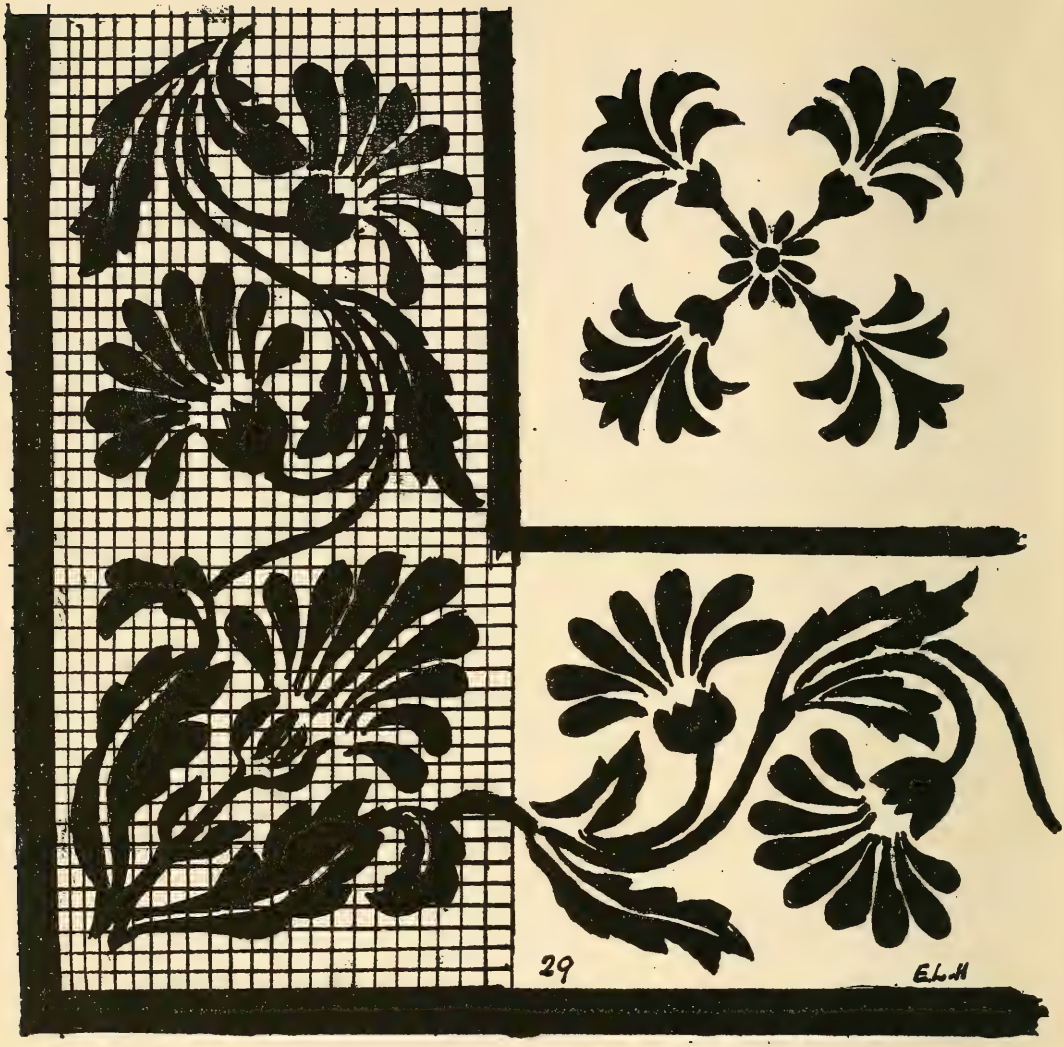
Jacquards. – Cross Border Tie Up –

Another form of tie up used for Towels. Rugs. Handkerchiefs. mufflers and table covers is shown in fig 28.
A 400 machine is selected for an example, it is divided into two equal parts, allowing 200 hooks for the middle of the cloth, and 200 hooks for the border and timmings. The border hooks have two leashes tied to each hook, this allows the 200 border hooks to work the pattern for both side borders; the side border is usually the same pattern as the cross border, and repeats on every 200 picks. the middle 200 hooks have to weave the cross border, so that the picks of the side border must correspond with the threads of the cross border; a seperate pattern is designed for the corners, it must be of such a character that it is common to both borders. the space A. B. C. D gives one repeat of the pattern for the side border and middle (centre). the side border and timmings being cut on one half of the card, the middle (centre) pattern on the other half of the card. A seperate pattern D.E.F.G is designed for the corner, the side border is then taken and placed in the position E.C. F G, another set of cards is now cut, the pattern D.E.F.G. being cut on the border hooks. the pattern E.C. F. G. being cut on the middle hooks. In weaving a handkerchief for which we will assume this pattern is suitable the cross border cards are put up to the jacquard first, one repeat only is woven. these cards are taken out of action, and the side border and middle (centre) set of cards are put up, and about a yard of cloth is woven. these cards are then put out of action, and the cards for the cross border brought into play. the direction of motion of the cylinder is reversed and one repeat only of the pattern is woven, and the Handkerchief is completed.

The method of tying up the harness is shown by dividing the comber board into sections, as before stated 200 hooks are used for border and timmings and 200 hooks for the body of the cloth; the directions for drawing the ends through the harness is indicated by the →

Fig 29 gives a prepared sketch cloth Seige 80s Reed 200 hooks for border and timming 200 hooks for body of cloth. fuller information is given on the plate.
Fig 30 Shows a pattern in course of construction, fill in solid, and make a suitable pattern for the body of the cloth. give four repeats on the squared spaces provided
Fig A. B. C. D. E. F. G give construction lines, and suggestions for border patterns

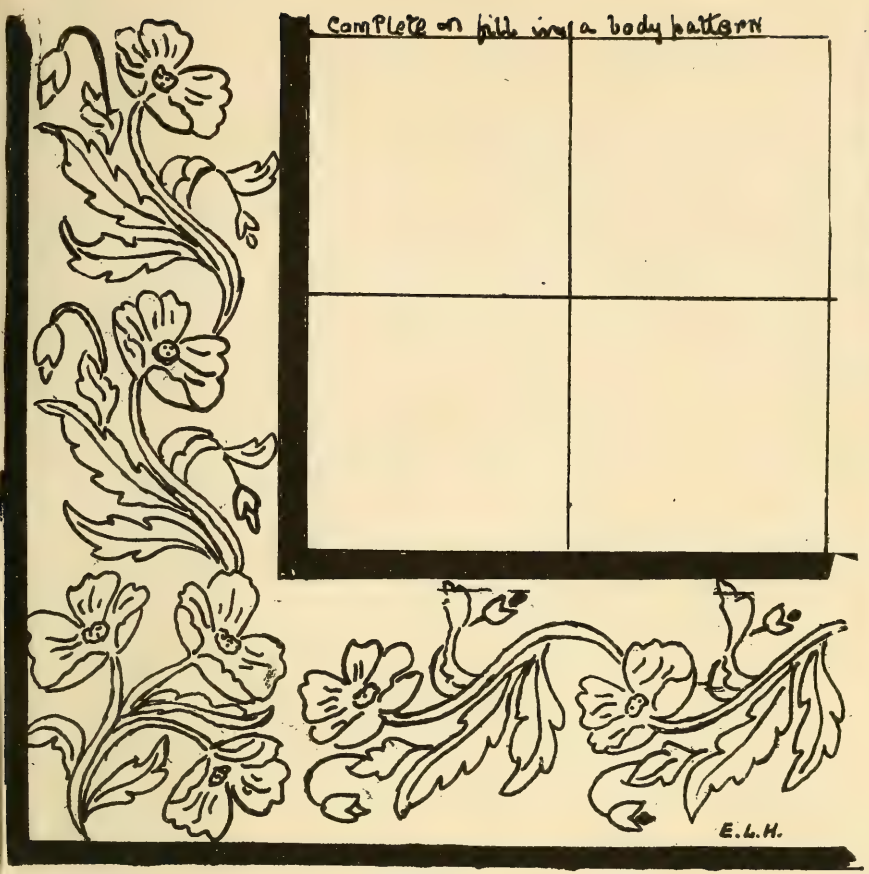
James Holmes



Sketch for a Crossborder Design

cloth size for a 8 80s Reed. 400 Jacquard tie up 200 hooks for border and tainmings and 200 hooks for body of cloth.

To enlarge the pattern ow to the working design paper, rule each design into small squares 25 x 25 take a piece of design paper 25 x 25 large squares (8x8) and copy the pattern from the sketch square by square on to the design paper. the design A side border is turned round when card cutting for the cross border B. as A and B are alike



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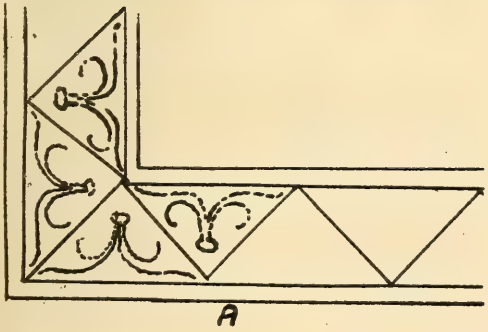

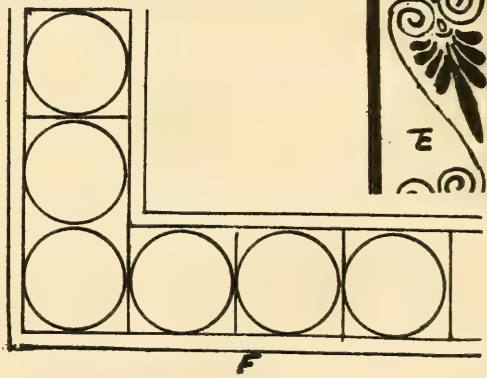

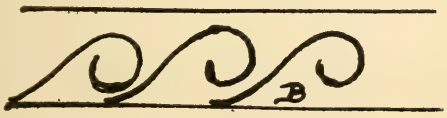

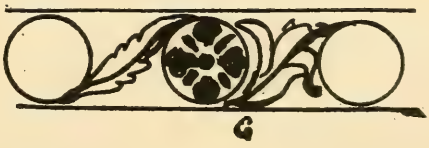

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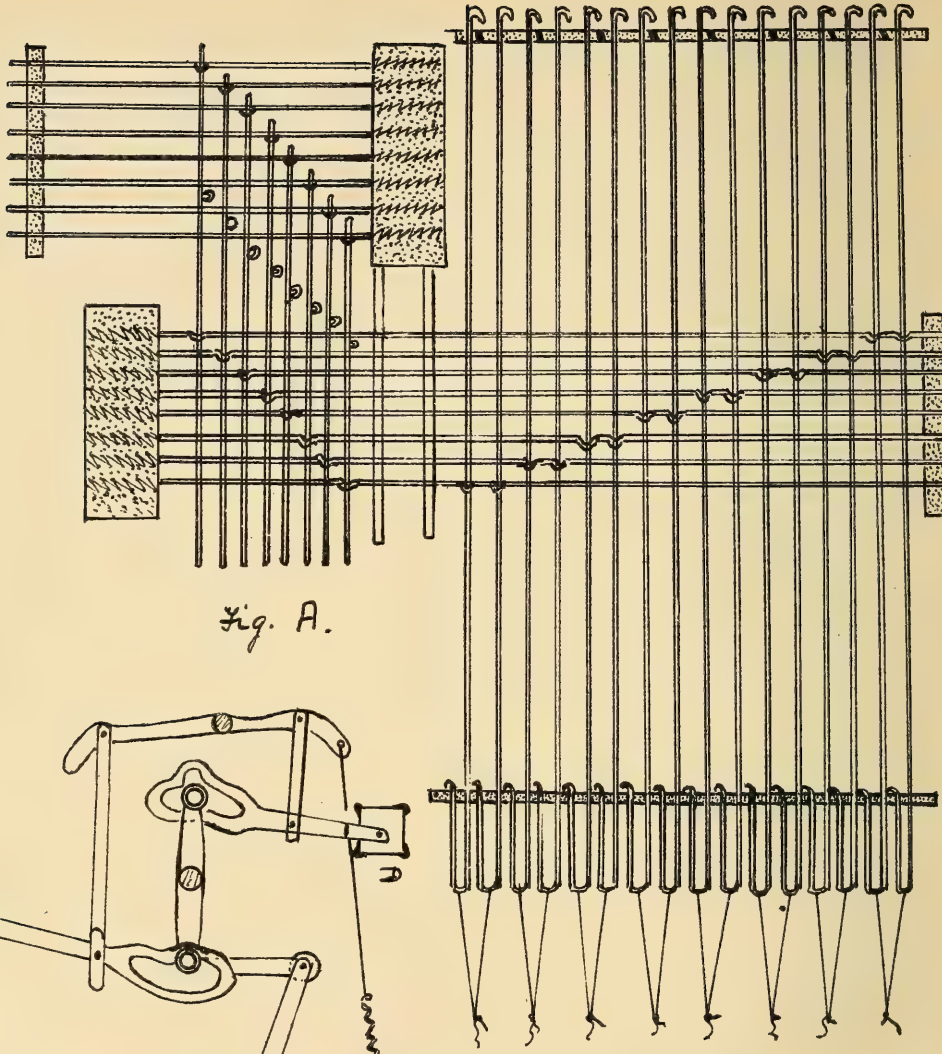


Fig. A.

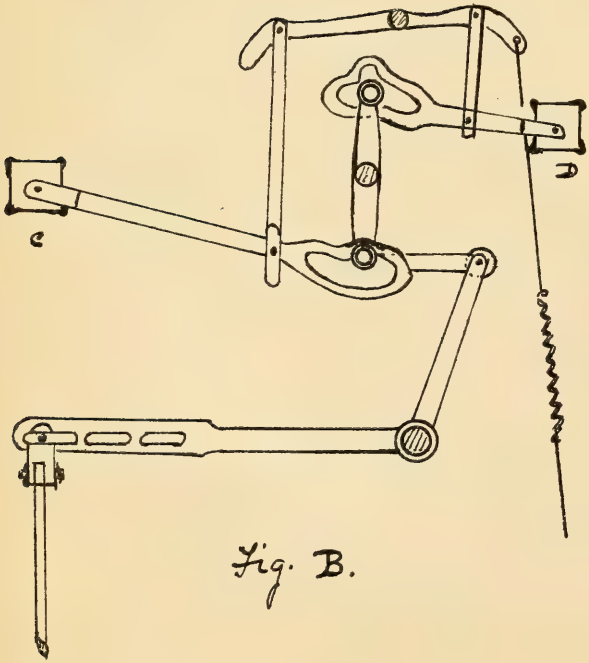


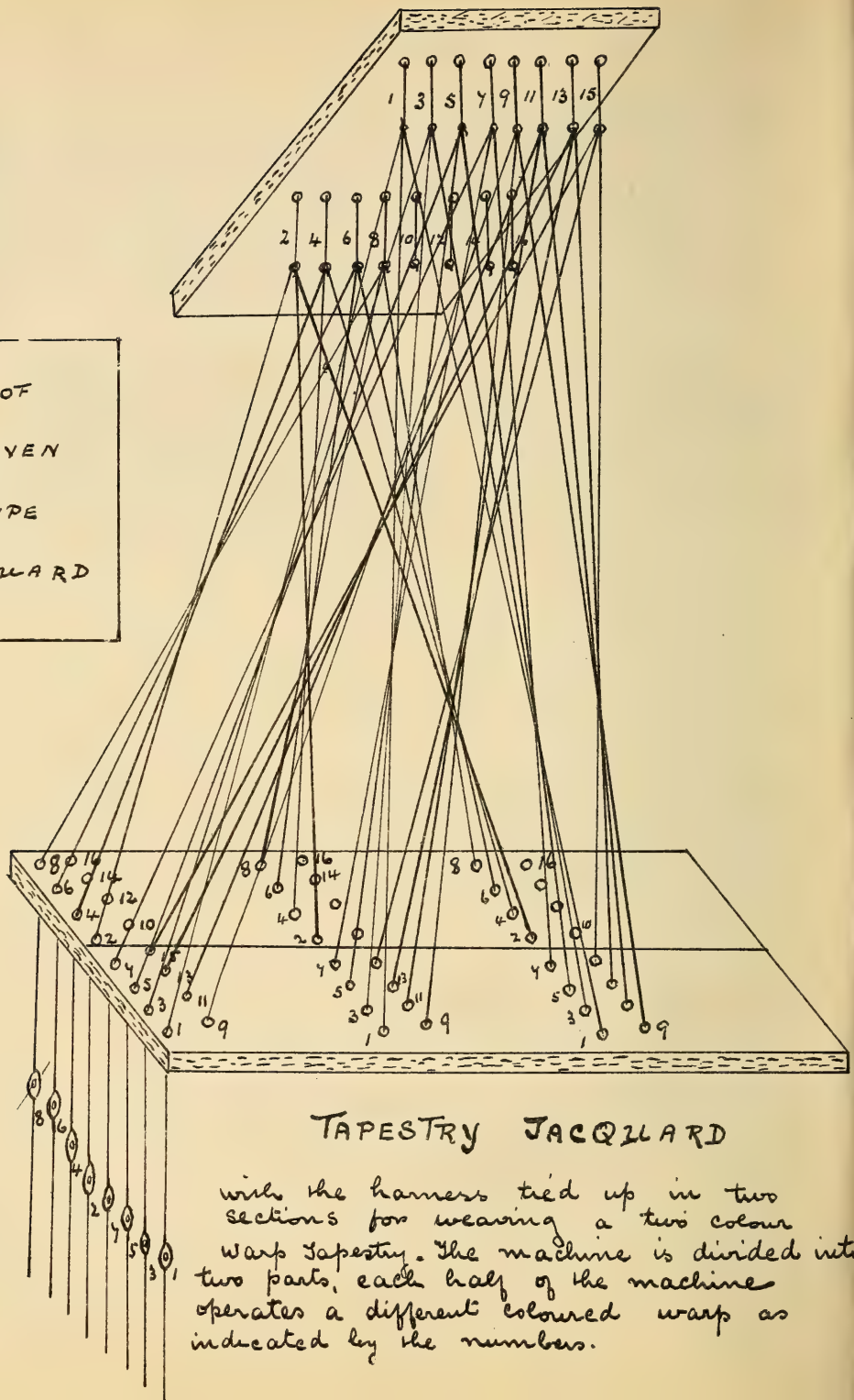
Fig. B.

CROSS BORDER JACQUARD

Fig. A shows the arrangement of the needles and hooks for the two cylinders.

Fig B. shows the method for putting the respective cylinders C and D in and out of action

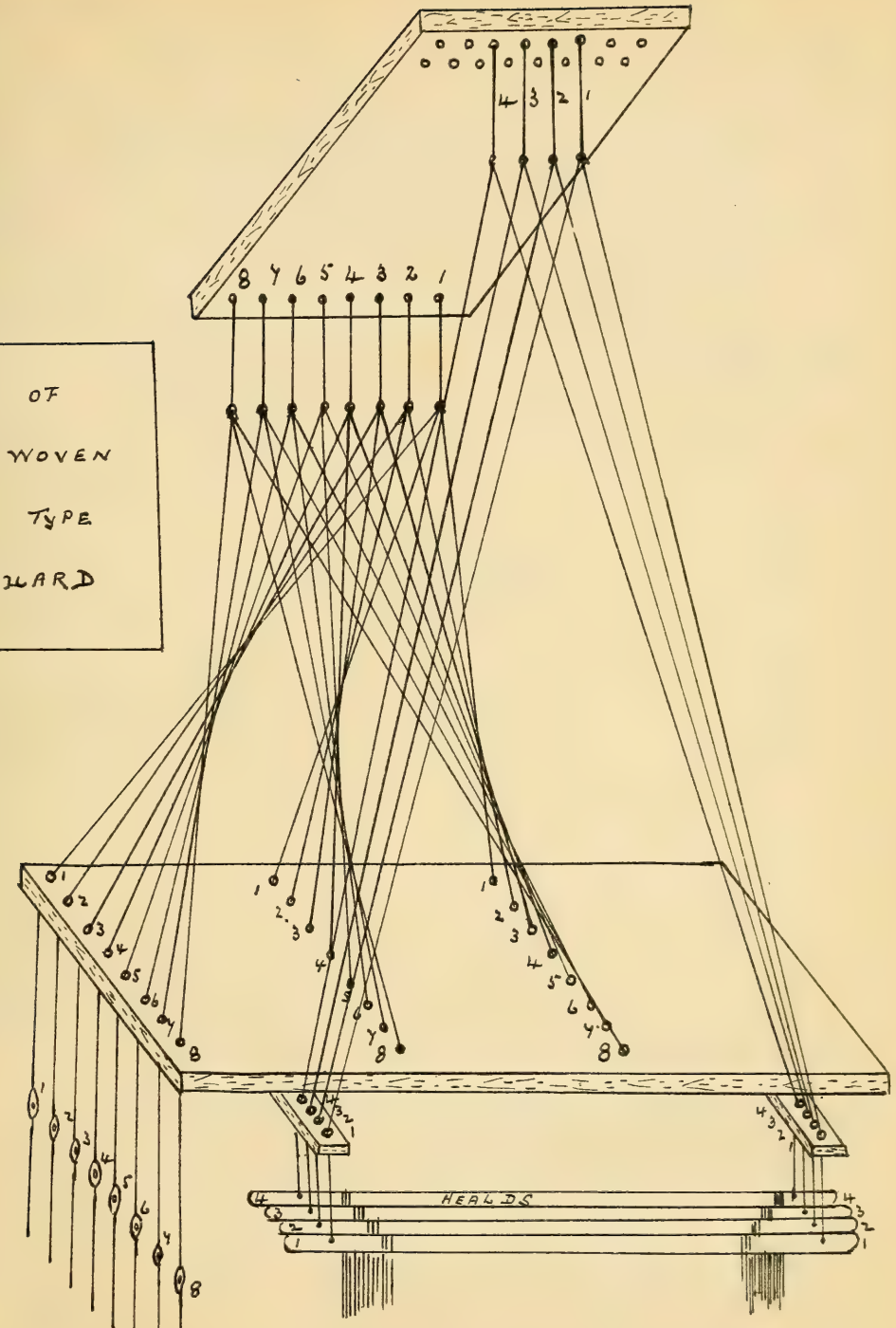
SAMPLE OF CLOTH WOVEN ON THIS TYPE OF A JACQUARD



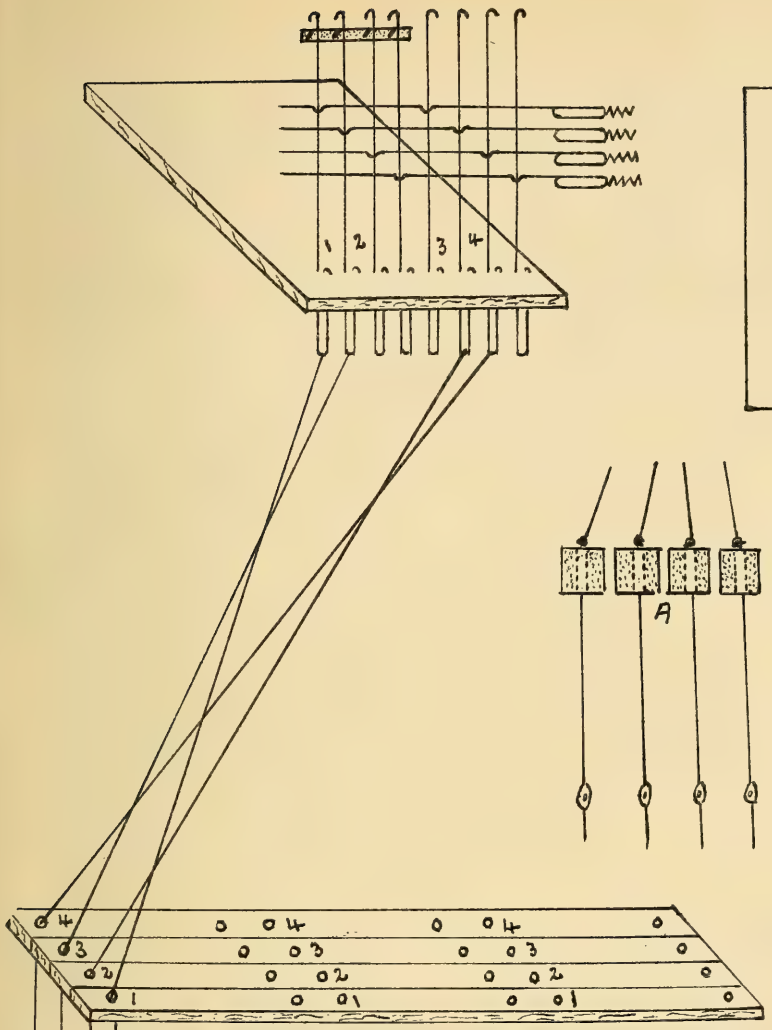
TAPESTRY JACQUARD

with the harness tied up in two sections for weaving a two colour warp tapestry. The machine is divided into two parts, each half of the machine operates a different coloured warp as indicated by the numbers.

SAMPLE OF CLOTH WOVEN BY THIS TYPE OF JACQUARD



COMPOUND HARNESS JACQUARD
for TOILET and Jacquard PIQUÉS



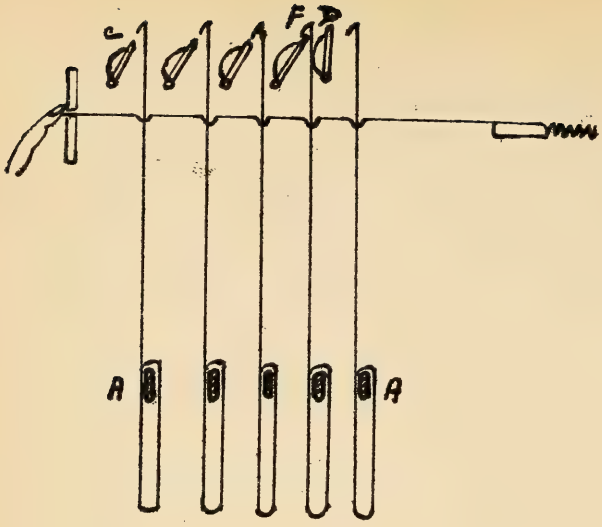
SAMPLE OF CLOTH WOVEN ON THIS TYPE OF A JACQUARD

JACQUARD for weaving DOUBLE PLAIN CLOTH.

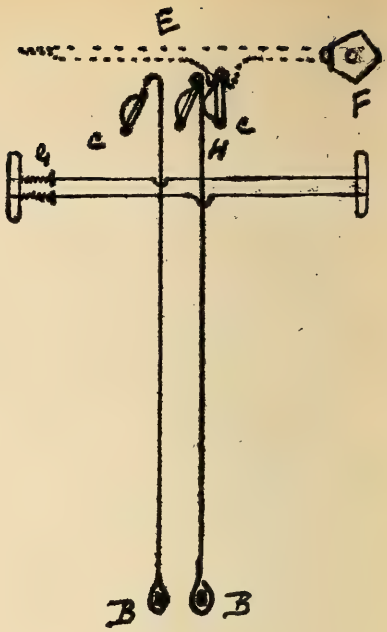
one needle controls two hooks worked by seperate griffes, practically the machine is divided into two parts, each part lifting its own colour of warp. The harness is knotted above the Comber board as shown in section at A. The comber boards is made up of four parts, and they are operated to weave plain cloth. The jacquard is used to lift the respective warps out of the way, where they are required to show on the face to suit the figure

Twilling Jacquard. In the weaving of large patterns, the great drawback is the increased size of the machine to be used, the additional expense and labour of card cutting, the first step towards increasing the capacity of the Jacquard was shown in the Bannister Harness fig 48; and the use of healds in front of the harness (Pressure harness fig.49.) is a still greater step, both in the increased capacity of the machine, and the saving of cards. The disadvantages of this mode of working, is the crossing of the yarn between the healds and the harness, causing considerable strain on the warp ends, to overcome this difficulty two or three machines have been introduced, which dispense with the healds, and perform the work by aid of the Jacquard hooks only, the principle underlying all these machines; is, that one needle controls 2. 3. 4. 5 or more hooks depending upon the ground weave patterns; each hook can be lifted from two points, Figs 51.52.53 illustrates the principles of weaving of the Bessbrook Twilling Jacquard, 5 hooks are shown controlled by one needle, each row of hooks rests on a bar A which extends from one side of the loom to the other, the ends of the bars at each side rest in loops of very strong hooks B in fig 53

The griffe bars C are movable on a fulcrum, resting over the griffe are a number of flat rods E with notches in the undersides the griffe bars fit into these notches, resting against one end of the flat rods is a revolving cylinder F provided with projections to push back the flat rods. The spring and collar G on the needle pressing back the bar through the hook where the projection on the cylinder ceases to act, when one of the flat rods is pushed back as in fig 53 one of the griffes assumes a vertical position and leaves down a row of hooks



5-1



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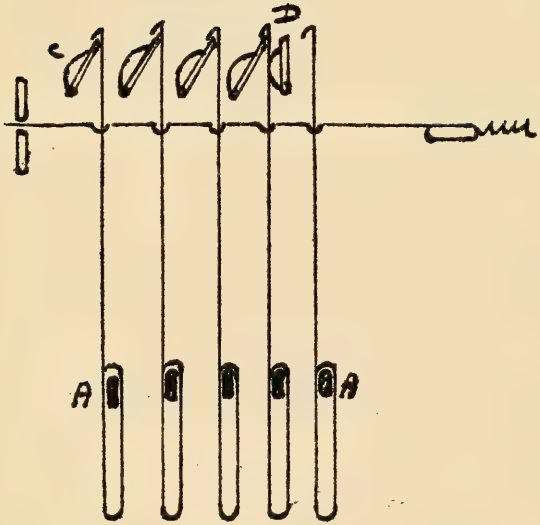

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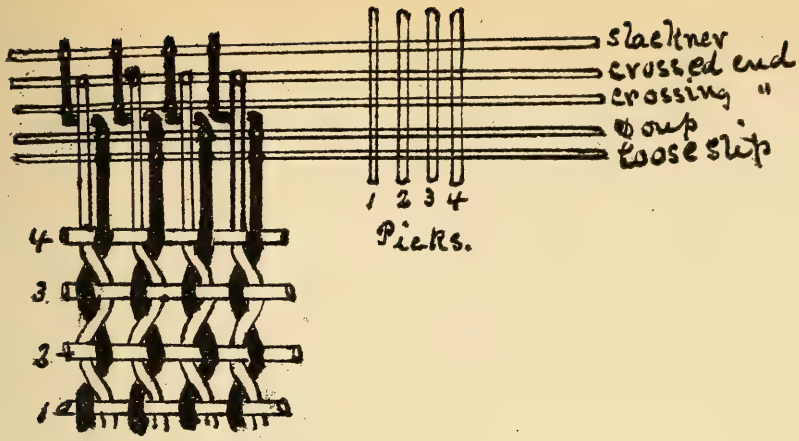
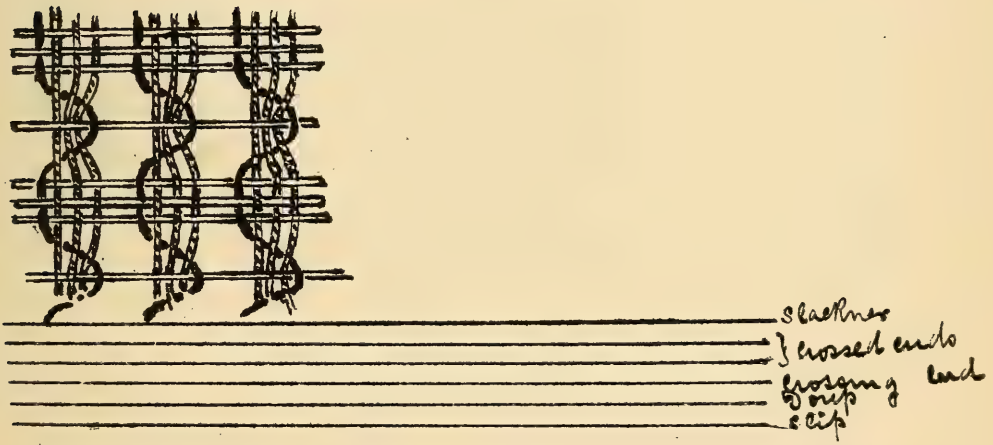
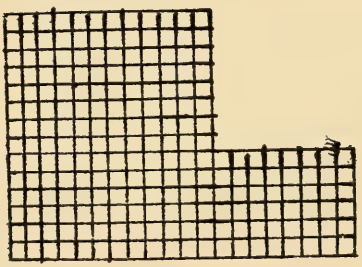

slackner
crossed end
crossing "
Loop
Loose slip
1 2 3 4
Picks.
4
3
2
1

54


slackner
crossed ends
crossing end
loop
slip

55



56

which otherwise would have been lifted fig 52; the full side of the vertical griffe in fig 53 pushes against the hooks H pushing it on to the griffe so that that row of hooks is lifted by the bar on which the hooks rest. Fig 51 shows the hooks pushed back all clear of the griffe, but the griffe bar D assuming a vertical position pushes the hook F on to griffe and the bar on which this row of hooks rests is taken up. Fig 52 shows all the hooks in a position to be lifted by the griffes but the griffe D assuming a vertical position left leaves down a row of hooks which otherwise would have been lifted

Gauze Weaving. In this class of weaving the pattern is produced by some of the threads of warp, twisting around other threads; to accomplish this a special form of heald is used, termed a doup heald, it consists of an ordinary heald, and half a heald the heald is termed the doup, the loose half the loose slip.

Fig 54 illustrates a simple pattern of pure gauze and fig 55 gives the sample cloth; the loomming is shown above the pattern; space is left for the lifting plan to be completed.

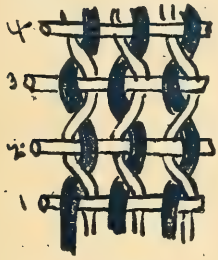
Fig 56 gives another example that must be completed. The loomming to be placed on the lines below the pattern, also the lifting plan.

On the space put down the pattern, loomming and lifting plan for fig 54. The term slackner is given to a bar over which the doupping end passes; this bar gives way when a doup crossing takes place, and prevents the threads from breaking

James Holmes Jr. Burnley

Leno Weaving

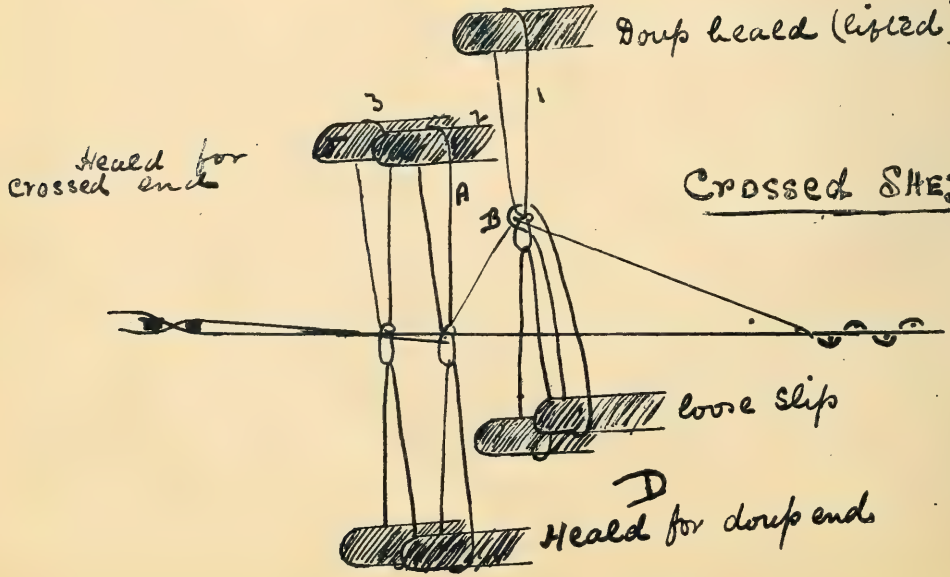
In this class of weaving one or more threads are made to twist round one or more other threads to enable this to be done every doup end is drawn through two heads, one of these is of ordinary construction A. the other consists of an ordinary heald and a loose slip B. the thread from A being drawn through the loose slip B. see figs C. D. In the making of a piece of pure gauze (E) the doup end is lifted on each pick, first to the right and then the left. the crossed end never lifting. this is clearly shown in c and D.



E

Open Shed Crossing

Heald through which the doup end is drawn, in addition to being drawn through the doup



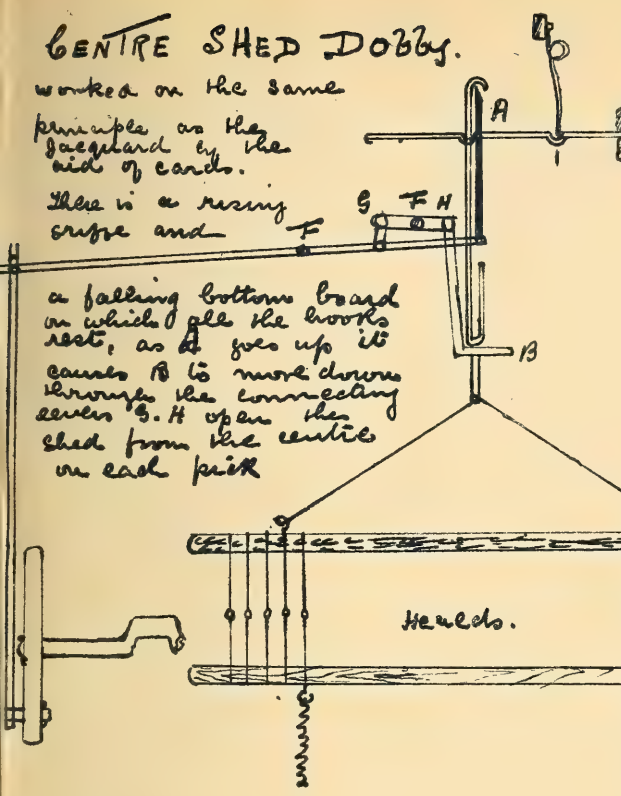
Crossed Shed

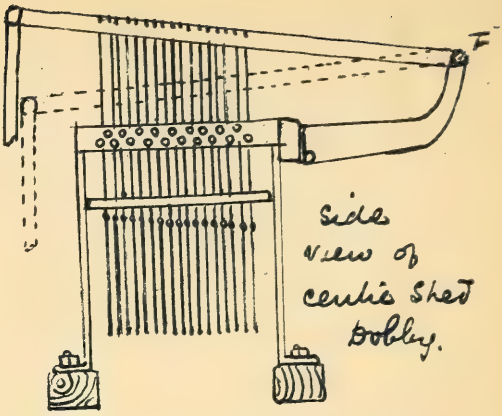
James Hodgson

CENTRE SHED DOBBY.

worked on the same principle as the Jacquard by the aid of cards.

There is a rising cripse and a falling bottom board on which all the hooks rest, as it goes up it causes B to move downwards through the connecting levers G. H open the shed from the centre on each pick

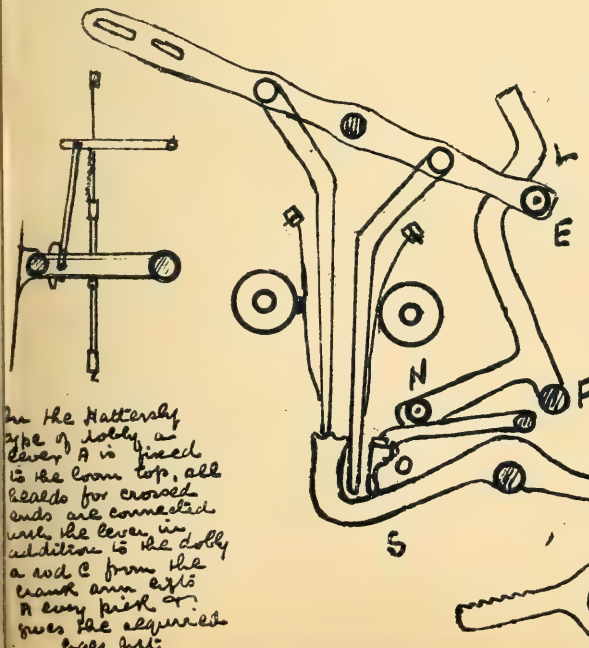




Side view of centre shed Dobby.

Single lift dobbies are most suitable for leno. a consideration of what takes place in weaving pure gauze E will make the matter clear. E requires 2 heards in addition to the doup heard no 3 heard is never lifted, the crossing or doup end is lifted on every pick, on the 1st pick it is lifted by the heards on the second pick by the doup. In a single lift dobby all the heards fall to the lowest point on each pick, and are then lifted to form the next shed, by this means the crossing end can easily pass underneath the stationary end, and be lifted first on one side then the other.

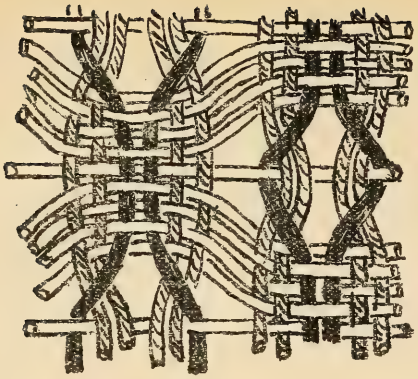
In a double lift dobby if an end is required to be up for two or more picks in succession it is not dropped to the bottom on each pick, but it is kept up it would therefore under ordinary conditions be almost impossible for the crossing thread to pass beneath the stationary end in pure gauze, and be lifted first on one side and then the other side of it. To overcome this difficulty the stationary end is lifted half way just at the time of crossing this enables the doup end to pass beneath it, and be lifted on the opposite side. In the Burnley dobby the bowl E passes the elbow L on each pick and in doing so, lifts the lever L.N. working on fulcrum F pushes down S and gives a half lift to the heards.

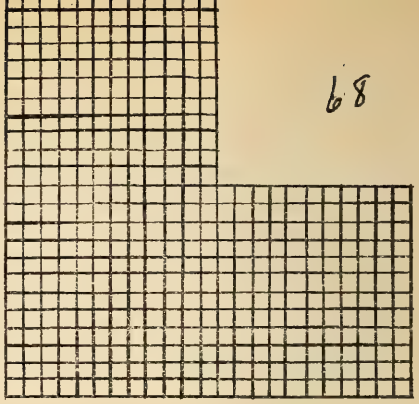


In the Hattersly type of dobby a lever A is fixed to the loom top, all heards for crossed ends are connected with the lever, in addition to the dobby a rod C from the crank arm lifts A every pick & gives the required easy lift

LENO MOTION BURNLEY DOBBY

James Hobbs





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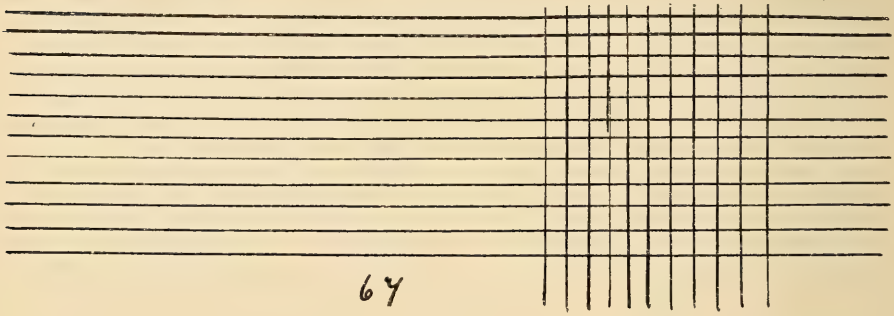

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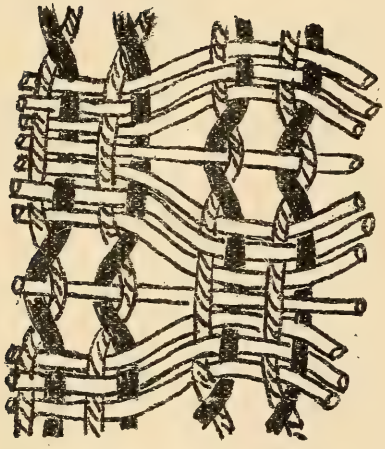

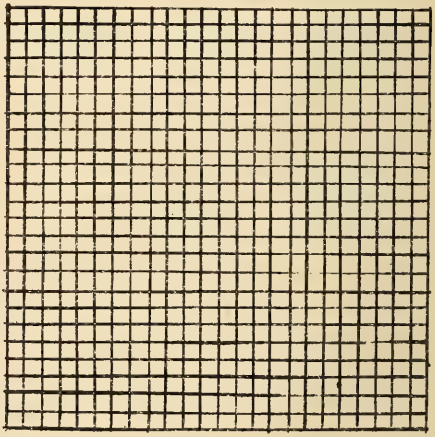

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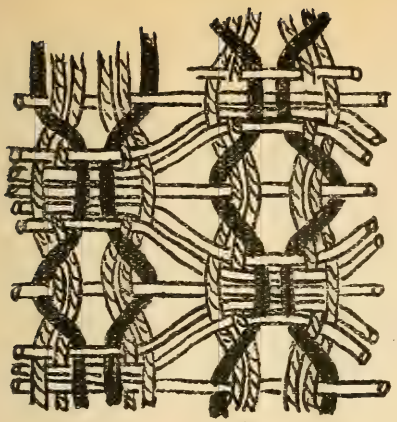
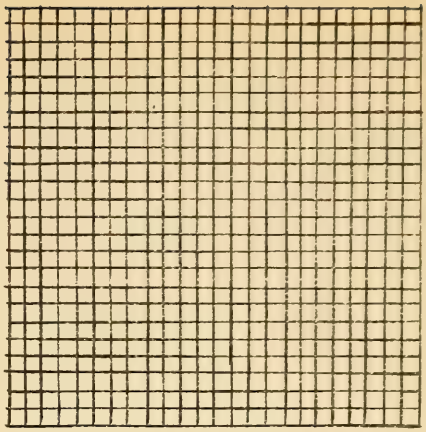
H

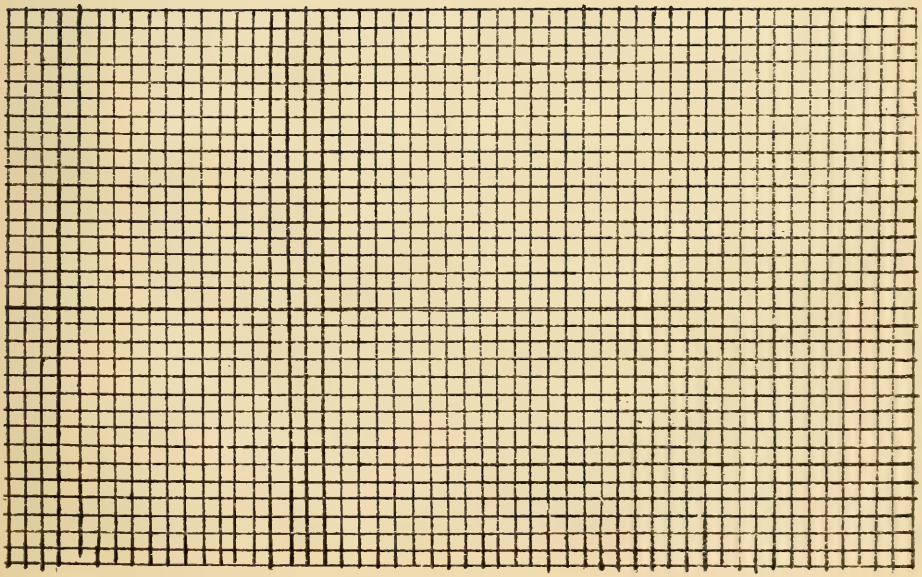
69



Y1



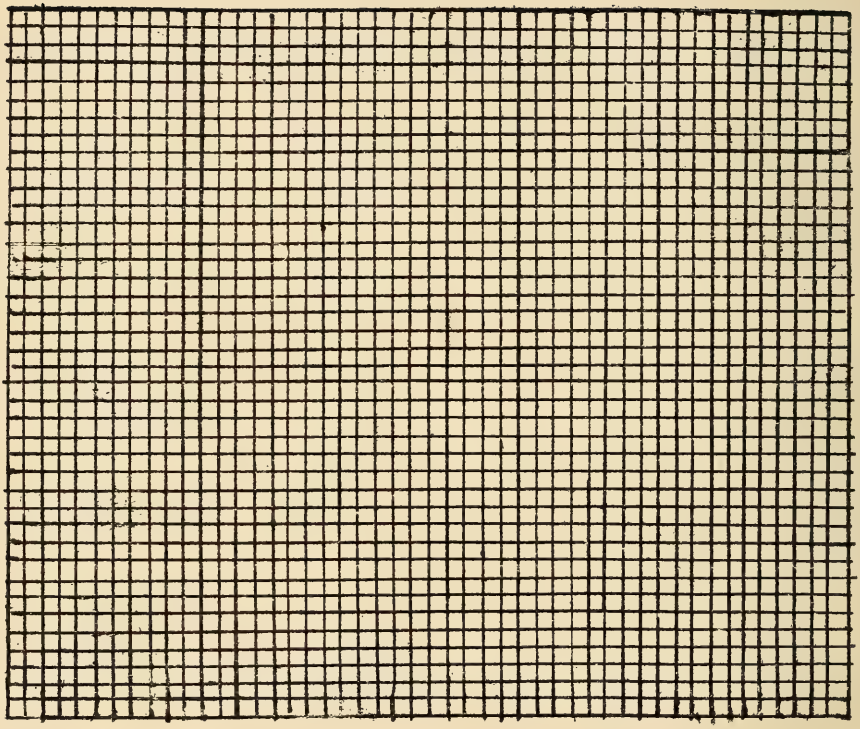
Y2



Y3

Y4

F1



Gauze Weaving

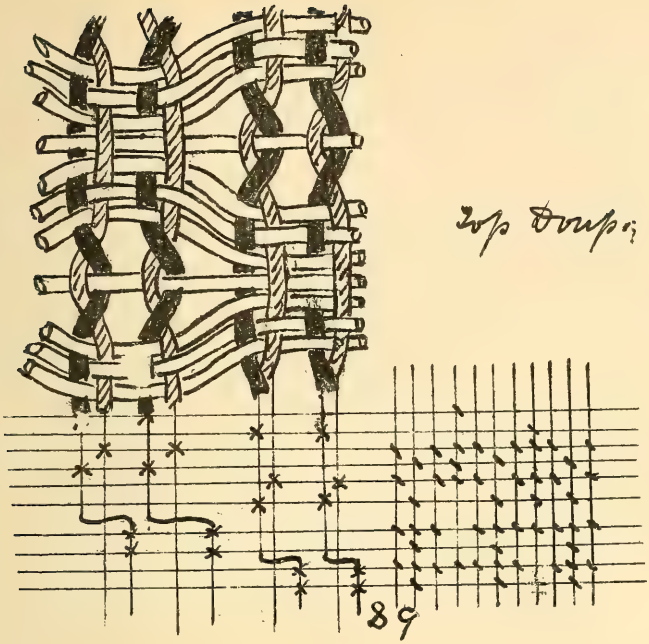
Put down looming and pegging plan for fig 67.
On design paper fig 68 Show design looming and pegging for fig. 67.
Show looming & pegging for fig 69. Show on design paper 70, design looming & pegging for fig 69.
Show looming & pegging for fig 71, Show on design paper 72 loom design, looming & pegging for fig 71.
Fig 73 gives a sample cloth place on design paper 74 design, looming & pegging.
Fig 75 gives a sample cloth show on design paper 76. design looming & pegging with full knitters instructions to enable the student to do this the following rules are given,
1st Find the reed used to weave the cloth.
2nd Estimate the number of dents which would be required in one complete pattern assuming that there are two ends in one dent throughout.
3rd Count the number of dents actually required in the example under consideration, then the difference between the estimated dents for 2 ends in one dent and the actual dents occupied will give the number of dents to be missed, a reference is then made to the sample cloth when it will be easily seen where the dents must be missed, or plucked out altogether after the warp is loomed

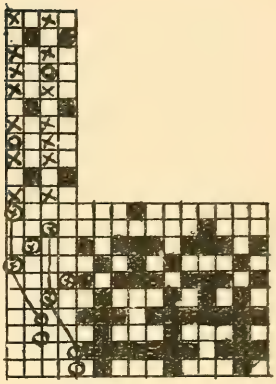
James Holmes M.C.A.Bradley

Gauze Weaving

Top Doups. Fig 89 illustrates a sample cloth woven by top doups, the doup end goes under instead of over the crossed end, in putting down the pegging plan from the looming given, the standard heald, namely the one through which the douping thread is drawn in addition to being drawn through the doup, is lifted whenever it appears above the weft: it is also lifted on those picks where the doup goes down, and in other examples which may occur (see figs 67, 69 and 71) it is also lifted when the doup end is lifted on the doup crossing side of the pattern; the doup is lifted on all picks except when it goes down on its own side, and whenever the doup goes down the slackner is lifted; the loose slip is down on all picks where the standard heald is down which carries the doup end, also on all picks when the doup is down; or in other words whenever the douping end is down the loose slip is down at the same time, on all other picks it is lifted.

In placing the pattern on design paper as shown in fig. 90 the filled in squares ■ indicate crossed ends (net ends) down, X^s indicates heald through which the douping thredd is drawn (standard) down. O^s indicate doups down, so that in placing down the pegging plan from the looming and design the blanks are selected for the lifting of the healds: Following these rules the student is recommended to work out the example


Top Warps
89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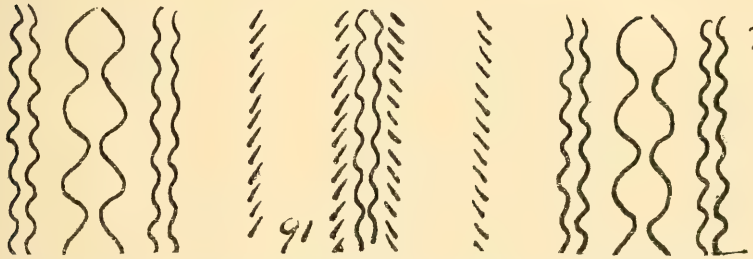
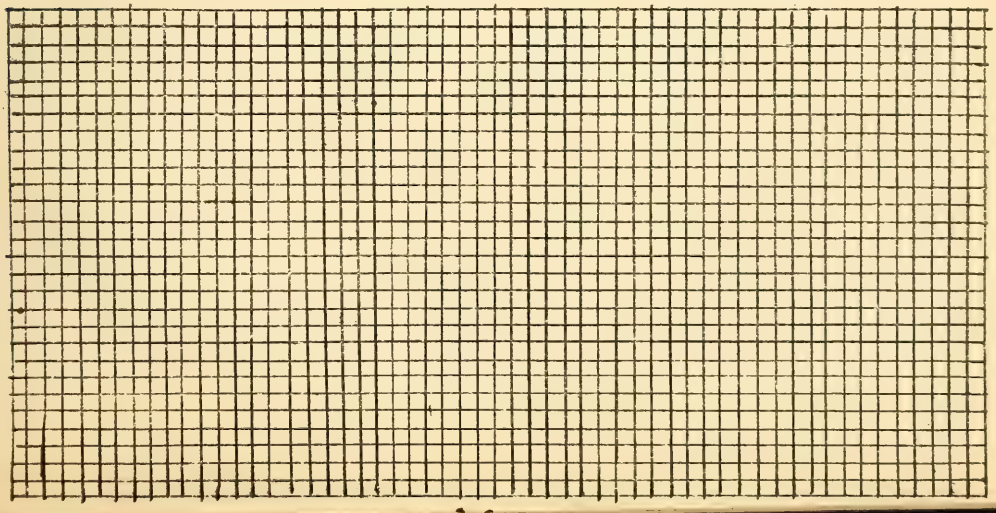

Bottom Warps
91

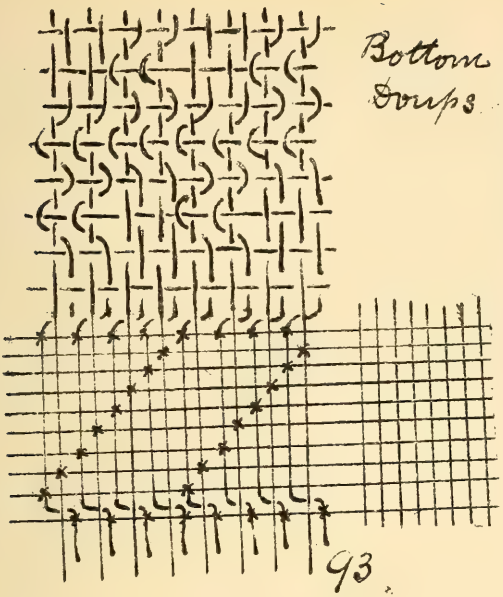


Using bottom doups place on space fig 92 the 24 design, looming and pegging to give the lace and twill effect fig 91. (City Guilds exam. question

Patterns produced by using one doup only

Many elaborate patterns of gauze and plain can be made by using one doup only fig 93 gives an example the looming is shown (and the pegging plan must be filled in); this is brought about by allowing the plain portion to be woven by the doup in the false position, the doups to weave in plain order throughout, the standard heald to do the crossing or weave the gauze portion of the cloth, not more than one pick can be placed in the shed when a crossing takes place. on the space 94 put down the design, looming and pegging for fig 93.

Fig 95 gives a sample of cloth, on the space 96 place the pattern, looming and pegging, where the ~~pattern~~ weave is repeating in any part of a stripe put down one repeat only, and write above it the number of repeats, give the reed in which it is woven, the number of empty dents missed if any and locate their position on the design. Use bottom doups, taking the design from the wrong side of the cloth.



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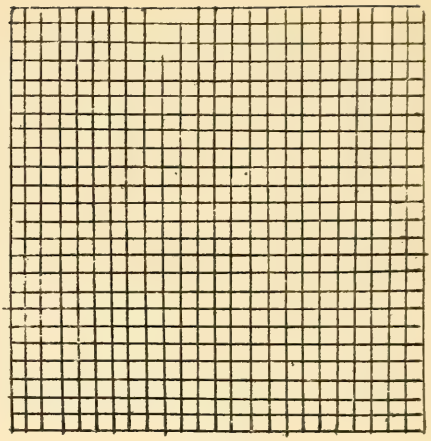

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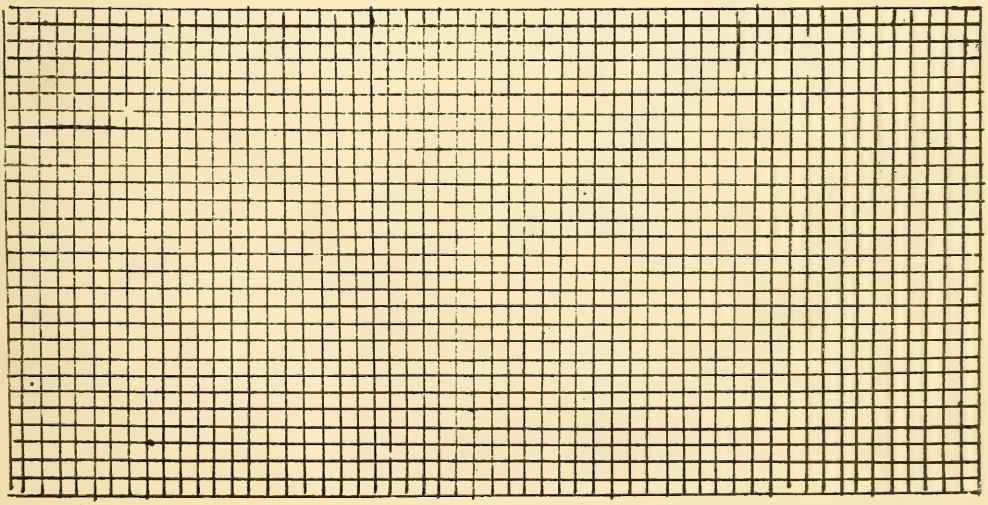

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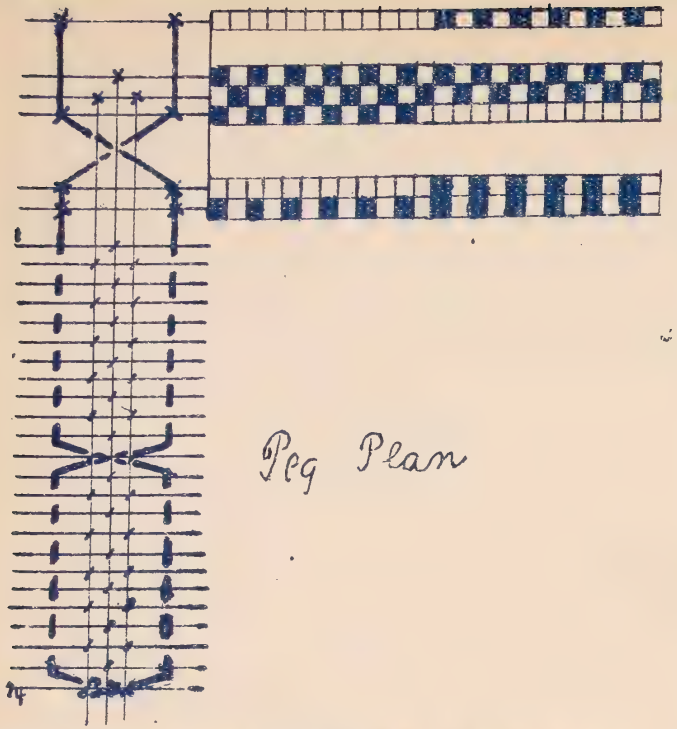
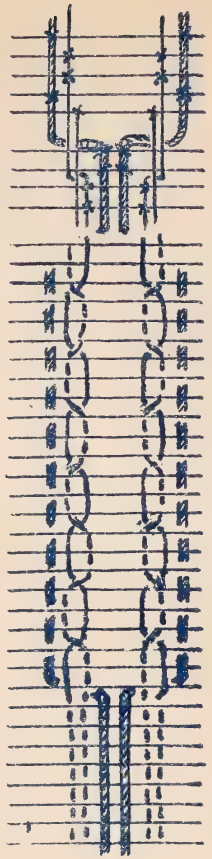
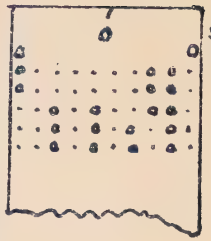
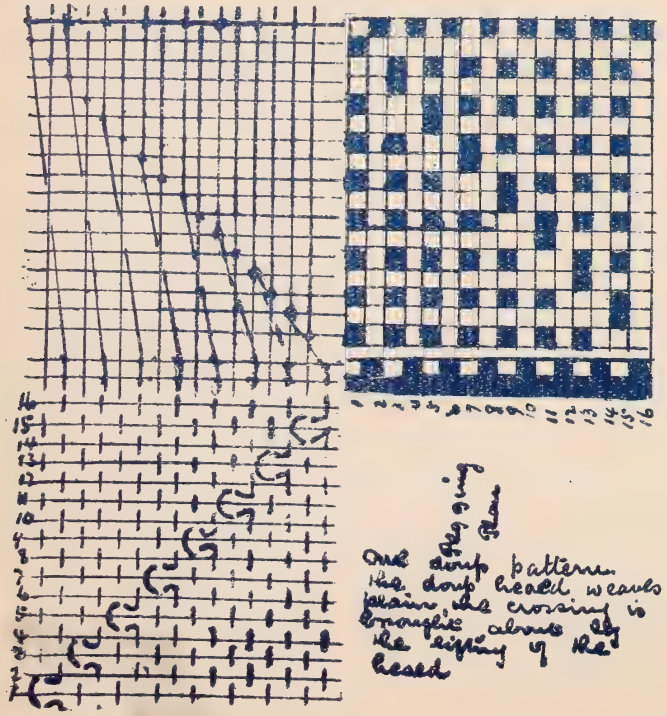


Peg Plan

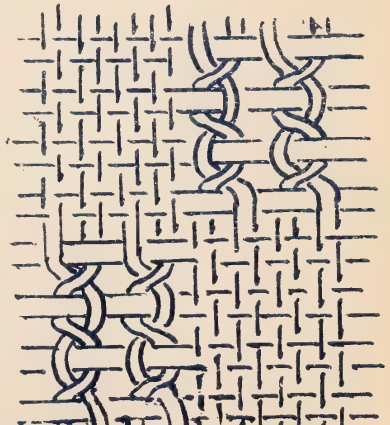




The above shows the card cutting for no 1 and 21 cards for pattern B



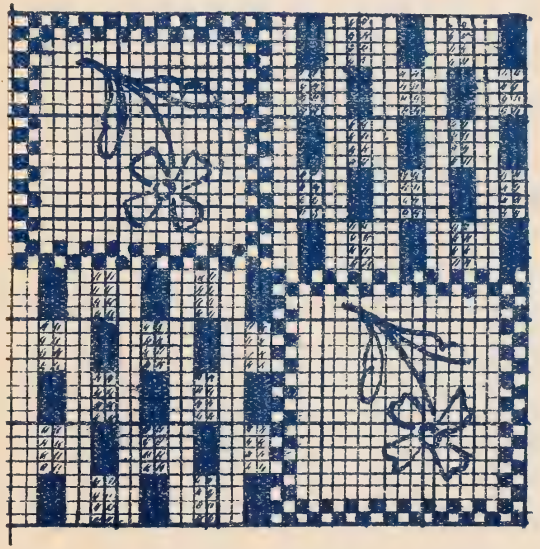
One drop pattern the drop heald weaves plain the crossing is brought about by the lifting of the heald



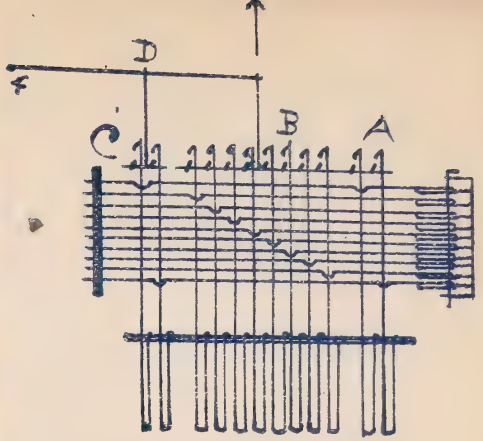
Mark out card cutting instructions for 16 ends by 16 picks to weave cloth as represented above.

James Nicholson

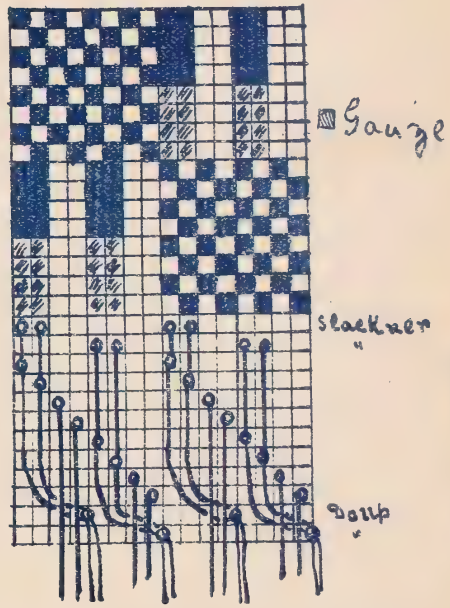
Reno Jacquard Design
200 ends 200 picks 90 Reed



The above sketch shows how the design must be prepared on design paper and put up on the machine for card cutting
Card cutters instructions
On those picks where there is no gauge crossing cut the pattern in the ordinary way on the middle 8 hooks when the 1st pair of drop ends are lifted cut the top needle
When 2nd pair of drop ends are lifted cut bottom needle



Arrangement of needles and hooks and lifting gripe
A Slackner harness hooks
B Ground "
C Drop "
D Gripe to give half lift to slackner harness.



The above sketch shows the looming for a Reno Jacquard

James Nicholson

Question 1902. Special Jacquards are usually employed in weaving Jacquard gauze. Explain the principle on which they are built and the arrangement of the harness required

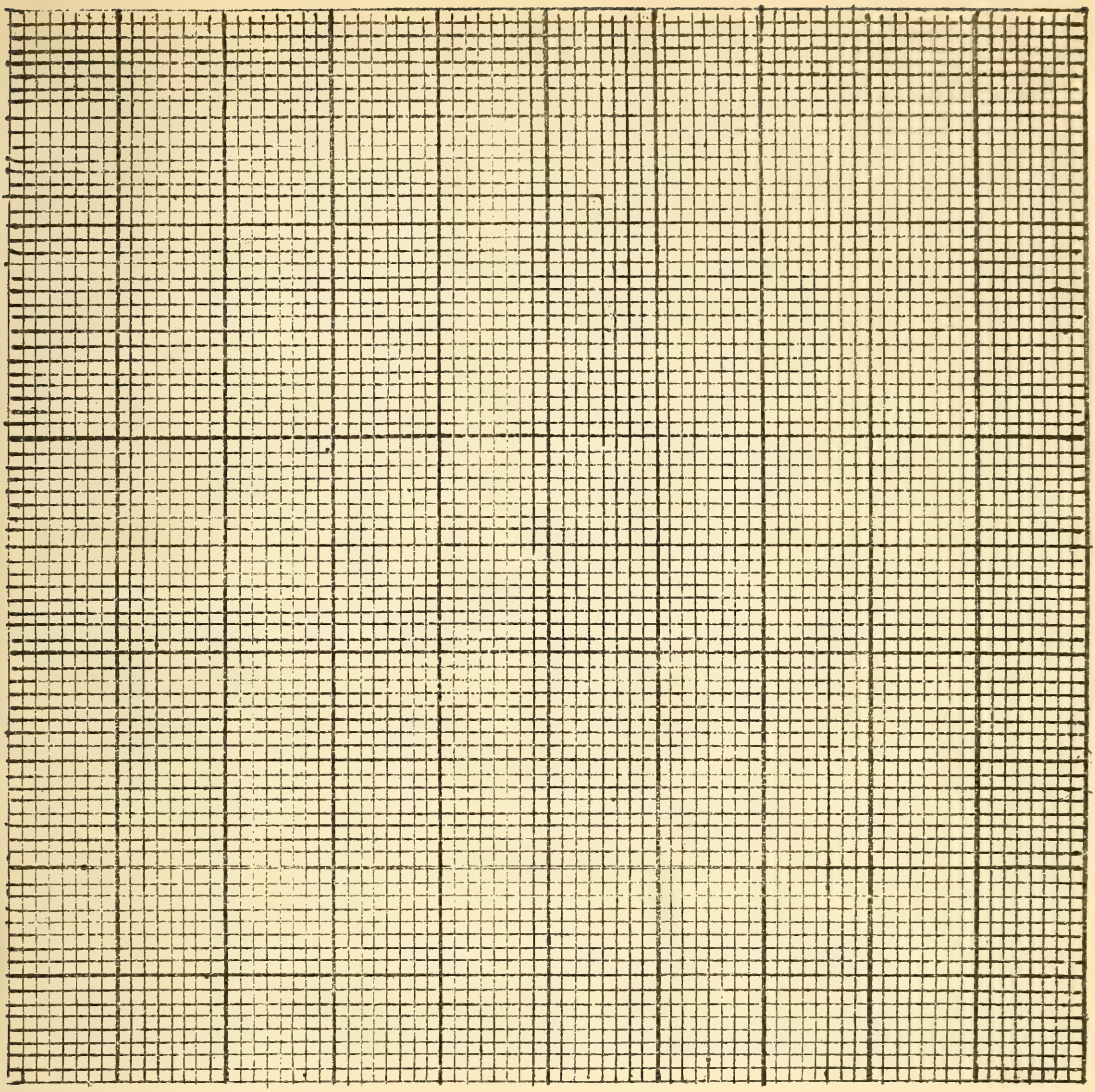
Sample of Gauze cloth

On space 104 put down design and looming of the cloth fig 106 weave the same by the means of healds, in any part of the cloth where the weave repeats put down one repeat only, with the number of repeats written above it.

Work out the weight of warp and weft in a piece of this cloth finished 28½" wide 100 yds long; if there are more than one colour of warp or counts give the weight of each seperately.

Weight of warp Yarn

Weight of Weft.



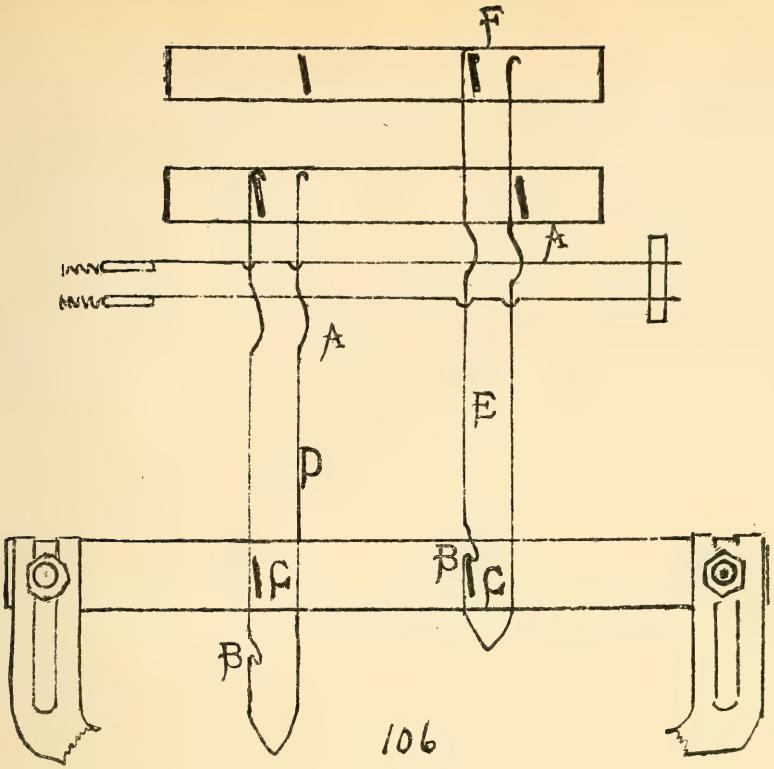
Jacquards for Special purposes.

Open Shed Jacquards.

In a single lift jacquard, each thread drops to the lowest point on each pick, and if required to be up for the next pick it is again lifted, with the introduction of the double lift machine, if a thread is required to be lifted for two picks in succession, it only drops half way when it is again lifted by the ascending griffe. The motion which gives the least strain to the warp, and reduces the friction to a minimum is, to keep each thread at its highest or lowest point, until required to change to suit the pattern. If an end is required to be lifted for two or more picks in succession it is lifted to its highest on the first pick and remains there, until it is required in the bottom shed to suit the pattern; machines of this description are known as open shed Jacquards. Fig 106 illustrates the principle of Thomis & Priestleys machine (Patent 1893) one needle operates two hooks either of which can lift the same end, the hooks about midway of their length at A are bended; a few inches from the bottom B of the hook it is bent still more, so as to form a kind of lip, between each row of double hooks, there is a stationary bar C, hook D is shown down, hook E is lifted by the griffe F. the hook is lifted sufficiently high, so that the lip at the lowest part of the hook comes above the stationary bar C. If the hook is required to be up for six picks in succession, the cylinder comes to the needles with a hole in the end opposite to this needle for 5 picks more, but as there is no action the hook still remains up., one or other of the griffes act on the hooks at each pick lifting them up about a quarter of an inch, but as there is a hole opposite to the needle on each pick there is no action, on the 6th pick a blank comes opposite to the needle pushing it back just at the moment the hook is being lifted and dropped one extra quarter of an inch, and as the hook drops: owing to the pushing of the needle back and the hook at the same time, it fall clear of the stationary bar C and comes down with the falling griffe, just at the time the griffes are passing each other the bended portions A of the hooks are passing through the slots in the needles, this allows the hook to spring back a little so that the ascending griffe clears the falling hook.

Willesdons arrangement is shown in fig 107, each harness cord A passes over a grooved pully B and is then attached to a stationary hook b this pully by a short connecting piece. D is attached to the centre of a grooved pully E placed above it, passing round E is a cord the respective ends of which are connected to two seperate hooks F and G either of which can be operated by one needle, two griffes are used if a thread is required to be up for two picks in succession, it is lifted by one of the hooks on the first pick, on the next pick the other hook goes up, so that the slack cord of the decending hook is taken up by the ascending hook, and the thread of warp remains unaffected at its top position.

James Holmes M.S.A. Burnley



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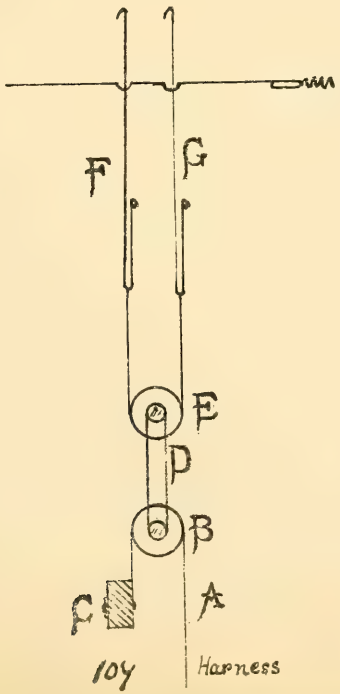


104 Harness

Fig 1.

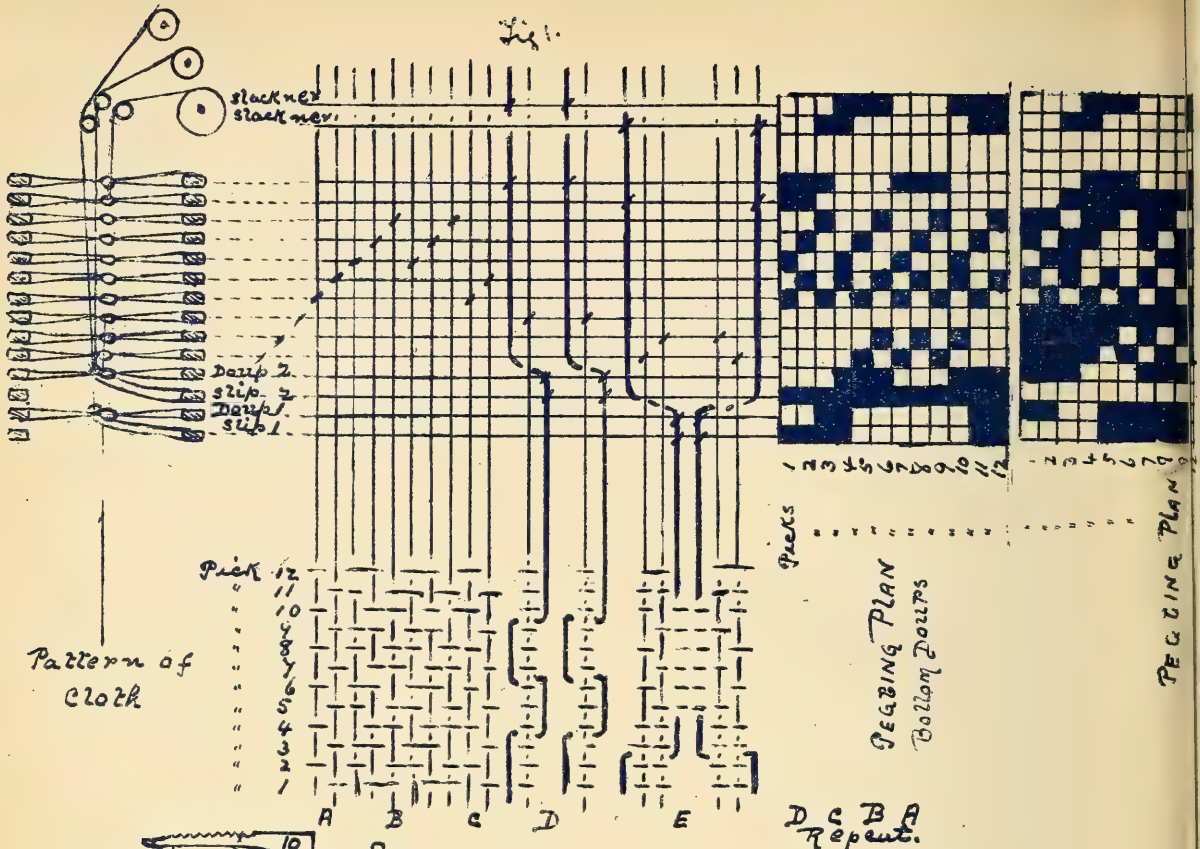
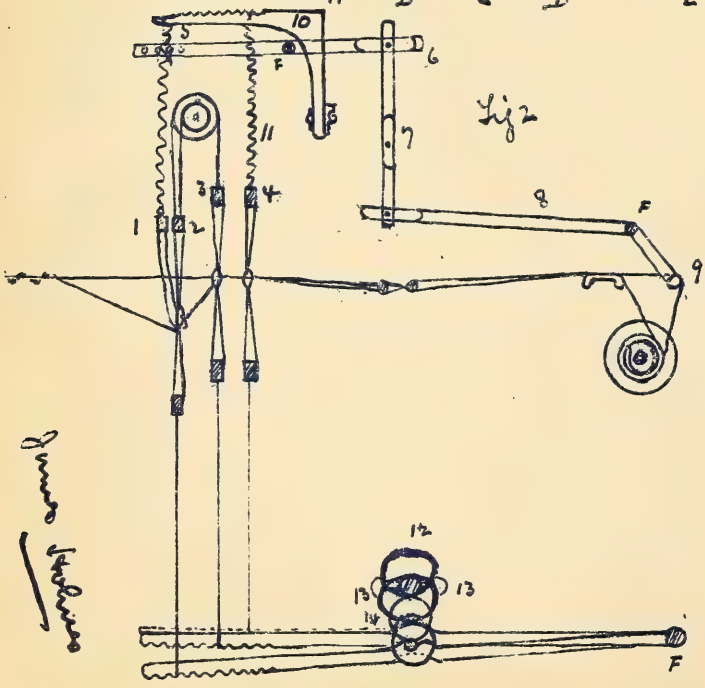


Fig 2



Lewis Jenkins

Leno Weaving

Fig 1 shows the arrangement of a leno pattern using two doups, a pattern peag the cloth is shown, and above the peag is the loooming. to the left is the arrangement of the heads; to the right is the pegging plan for both bottom and top doups.

This is a very good idea for taking down the arrangement of the heads also the looming from the looms weaving shuttle in the shook.

You are sometimes in examination questions expected to give peg peag and patterns for examples using two or more doups. This shows how you can quickly do this and also shows the effect you wish to produce in the cloth.

In the peg plan for top doups blanks become picked in squares throughout, except slackners which are the same

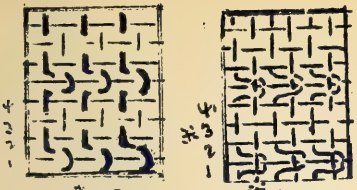


Fig 3.

Fig 4

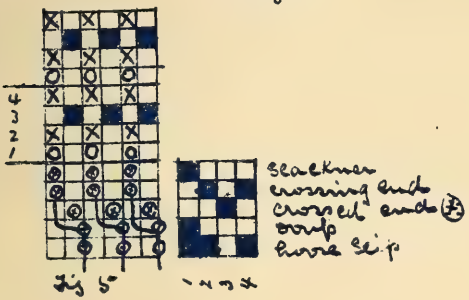


Fig 5

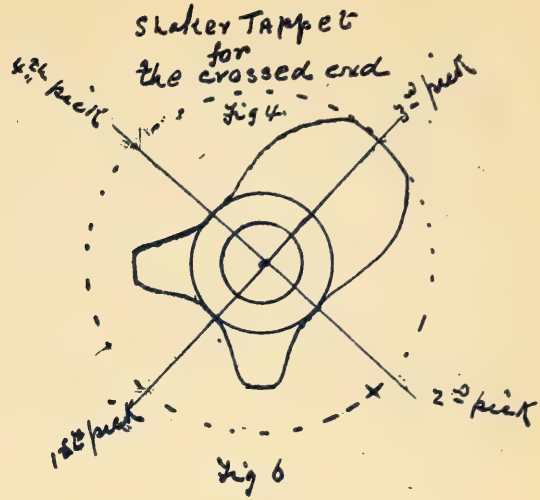


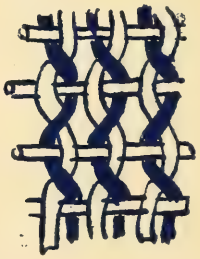
Fig 6

Top Dowps. and Leno Weaving by the aid of Tappets.

Top dowps have many advantages over bottom dowps, namely the pattern is on the face of the cloth. therefore any imperfections can be more readily seen. the dowps are in a more convenient position for repairing. Shaking contrivances can be more readily and become more direct in their action this is especially so in the case of using tappets for weaving Lenos.

Fig 2 illustrates the arrangement when weaving a gauze cloth one end crossing one. the crossed end is lifted every pick. and the dowp end is taken down every pick but by the dowps and then by the heald through which it is drawn in addition to being drawn thro. the dowp.

The pattern is shown in the margin of this paper, the solid line represents the dowp end and a crossing takes place by the end being taken dowps either to the right or the left of the end that it crosses.

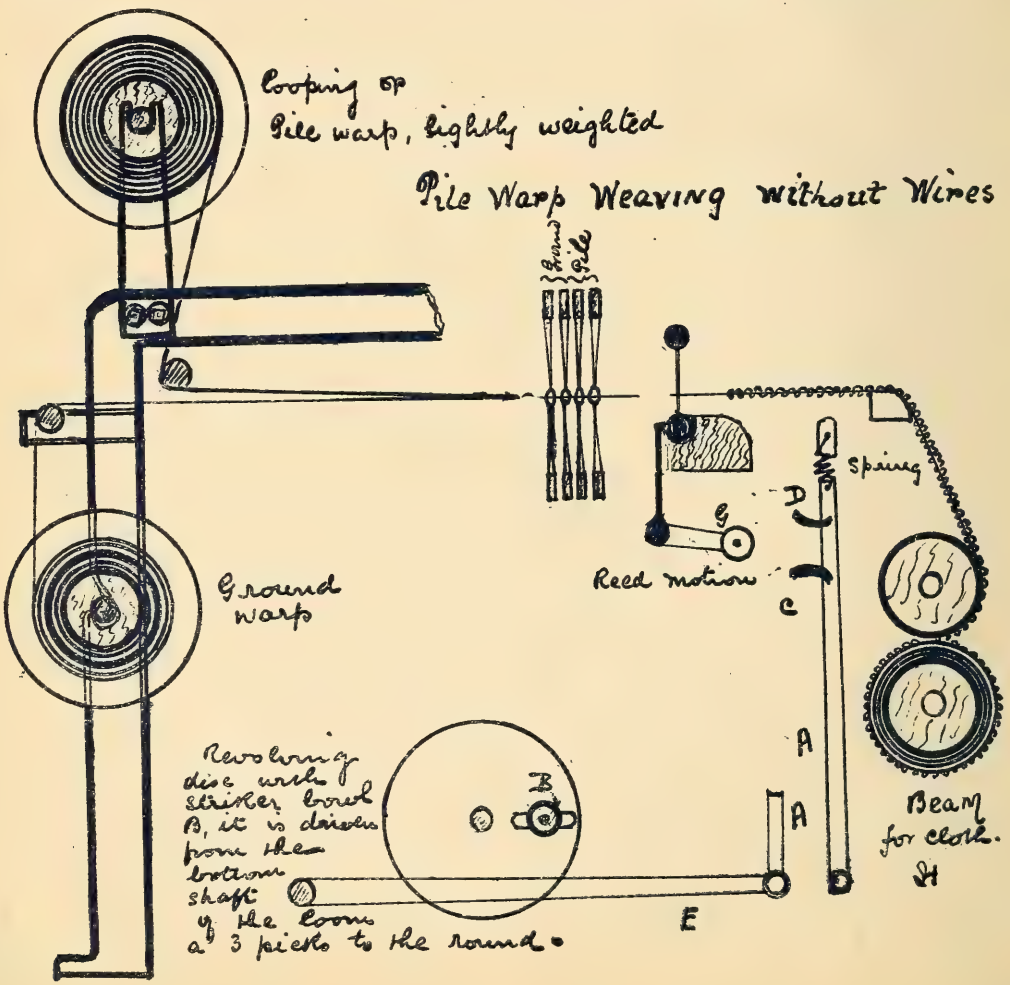


In fig 2 1 is the loose slip connected by a spring to the fixed arm 10. 2 is the dowp in connection to the top roller and also to the slackner lever 5 work its fulcrum at F, the other end 6 is connected by 7 and 8 is the slackner rod 9 over which the dowp warp passes. In this case both crossed and crossing ends can be worked from one beam. 3 is for the crossing end, or it is the heald through which the dowping end is drawn in addition to being drawn thro. the dowp. 4 is the heald for the end which is lifted on every pick. the tappets 12 and 14 work the healds 2.3. also no 1 the loose slips. Tappets 13.13 works heald 4 pulling down a half lift just previous to the crossing taking place.

There shaker arrangements are only required (both in dobbies and tappets) when a shed is made by the dowp immediately before or after a shed is made by the crossing end (namely the heald thro. which the dowping end is drawn). the examples D.E. fig 1 will require shakers. Figs 3 and 4 shows an example by 4 showing the appearance on the face of a cloth. to be woven by tappets. fig 3 shows the underside of the cloth. In this case the crossed ends will be taken down on no. 3 pick to form a shed it will also be taken down a half lift between 4th and 1st and 1st and 2nd to enable a crossing to take place.

James Hudson

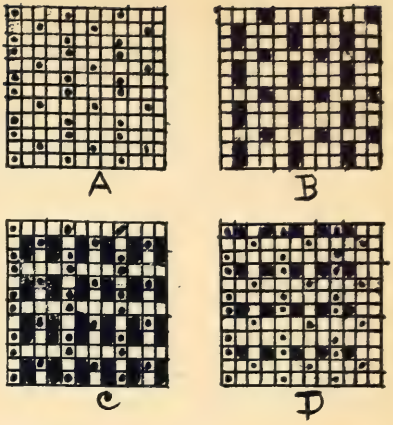
Pile cloths are placed in two divisions 1st those in which the pile is made without the aid of wires, and 2nd those in which the loop for the pile is made by the insertion of a wire instead of a pick of weft. The first named are known as "Terry cloths" the weave is largely used in making Turkish towells. The loop is brought about by the reed giving way for two picks, leaving these picks about half an inch from the fell of the cloth, on the third pick the reed is held firm, and in beating up, brings the looping warp (which is held quite slack) forward in the form of loops on one or both sides of the cloth. The mechanism is shown in the sketch below. On the loose reed picks lever at E is up and lifts up A, C comes into contact with bowl, lifts it up, and forced the reed out, this takes place for two picks, on the 3rd pick B comes into contact with E forces it down, this brings down A and D presses against the top of the bowl G, and holds the reed firm for the fast pick



Question 1899. Explain the structure of a three pick terry fabric. Explain how figured Terry is usually produced, and mark out a design for a Circle to be developed in Terry.

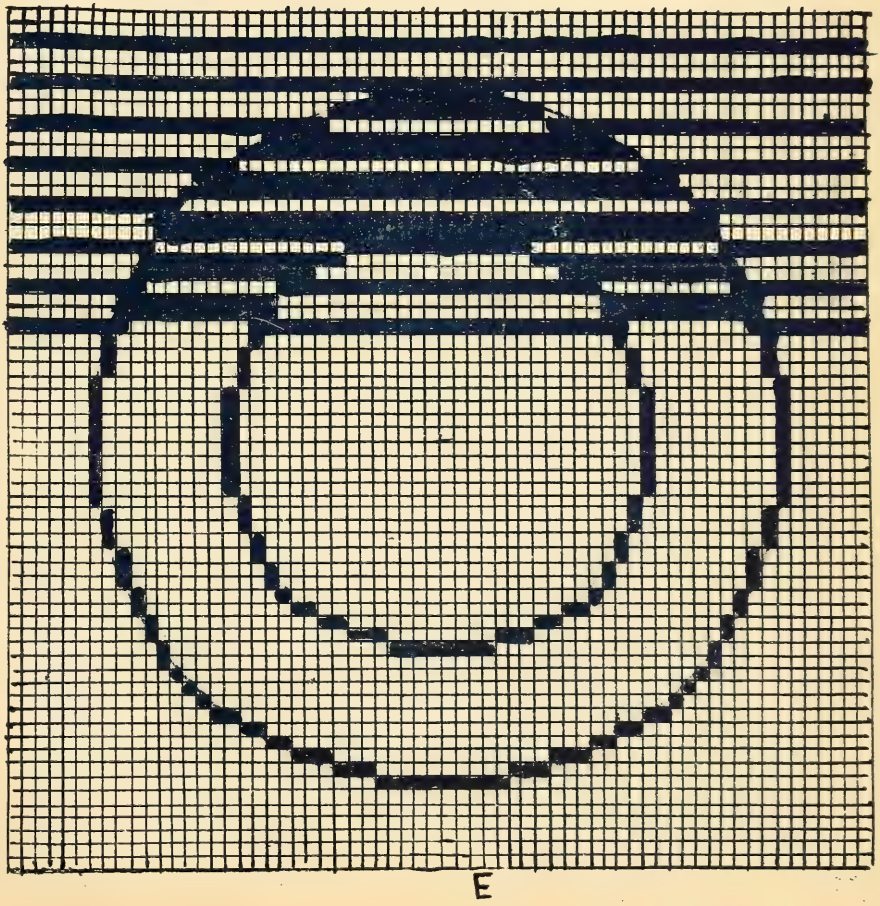
For couple answer see sketch of loom, and design E.

There is a ground warp and a pile warp. In A ground warp only is shown. In B only the pile weave is shown. half thrown to the back and half to the face. C shows ground warp ⊡ and all pile thrown to the face. D all the pile to the back



In this design for a circle in Terry pile. the ground warp weave is not shown as two heads can work the ground, and leave the Jacquard harness to weave the terry in conjunction with the reed motion

Complete the design



James Holmes

Warp Pile Cloths. In these cloths the pile is made by the warp. The bruch like appearance on the surface of the cloths is due to the insertion of a wire instead of a pick of weft. These wires when cut out leaves the warp yarn standing erect on the face of the cloth. if the wires are withdrawn without cutting the warp, loops are formed in the place of cut pile. The ground wa weave of these cloths is plain, but seen from the back of the cloth the reason for this. is. for two picks the ground warp weaves plain cloth. the next two picks B.C. are alike. but a wire pick occurs between these two picks. the pile warp only being lifted and a wire inserted as shown below fig C

The pressure of the two picks upon the pile warp forces the wire on to the surface of the cloth, and causes the pile to stand more erect. a pattern for a pile cloth 1 pile end 1 ground end is shown at A. in this example all the pile warp is lifted on each pick and the form of binding in of the pile warp to the cloth is shown thus. in examining a piece of cloth of this character one of the most important points to notice is the form of binding. this can easily be seen by pulling some of the pile away, afterwards pull out the pile for about ½" square so that the ground weave is exposed.

It is not always advisable to lift all the pile warp on each pick. but to lift half the pile warp on alternate picks, and secure the pile to the cloth by a loop thus an example of such a cloth with a plain back is shown at B. the back weave from the underside appears. the reason for which, has been previously explained. a sectional view of this class of pile is shown below fig D.

The non cutting wires are of this shape and when withdrawn make loop pile In hand loom weaving the cutting wires are made with a small groove along the top or in two pieces soldered together at the ends. these wires are cut out by running a small knife along the groove See fig 213. "Cotton Cloth Designing"

When a jacquard is used a great variety of patterns can be made by allowing the jacquard to operate a pile warp, and a set of heads the ground warp, different thicknesses of wire can be used to develope figure in high and low pile, or by using cutting and non. cutting wires in combination with each other, or by the development of pile figures, on a plain twill satin or gauze ground. the pile warp in this case when not figuring on the face is floating loosely behind the cloth. sometimes it is allowed to weave seperately and apart from the other cloth in some simple weave, so as not to be too loose. when the cloth is taken out of the loom this loose material is easily pulled away as waste. fig E

Another very fruitful source of design is the making of patterns in loop and cut pile. where the figure in loop and cut pile appears to be continuous across the piece. to produce this effect the wires are

inserted as follows - Part of the pile warp is lifted for producing the figure in cut pile and a cutting wire inserted, the shed is closed and the rest of the pile warp is lifted for the next pick and a non-cutting wire inserted with no ground picks of weft between the two wires. When the two wires are woven into the cloth and the non cutting wire withdrawn, and the cutting wire cut out a line of cut and uncut pile appears across the piece. See fig F

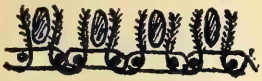


Fig C. showing pile warp issuing between two picks in the same shed

Fig D. showing section of cloth for pile lifted on alternate picks

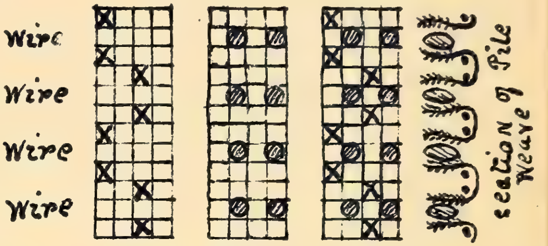


Fig A

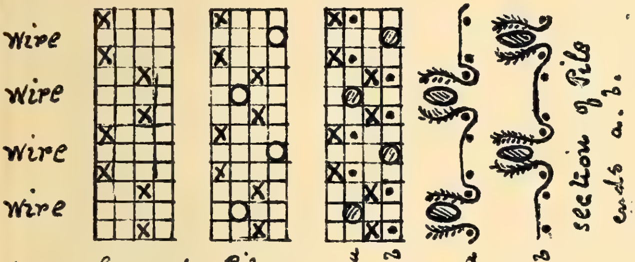
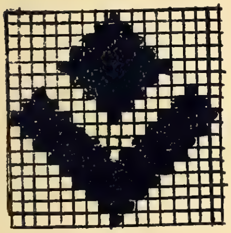
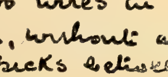


Fig. B



design for figs E and F



Section showing figures are made in cut and loop pile, two wires in one shed, without any ground picks between see fig F

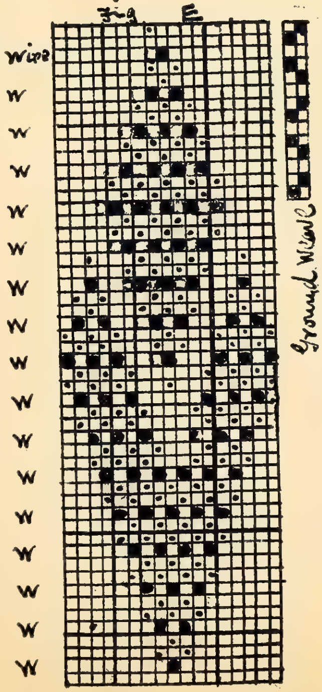


Fig E

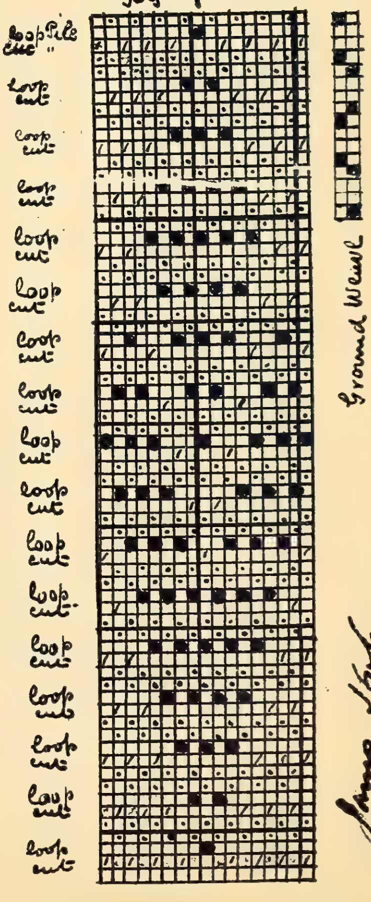
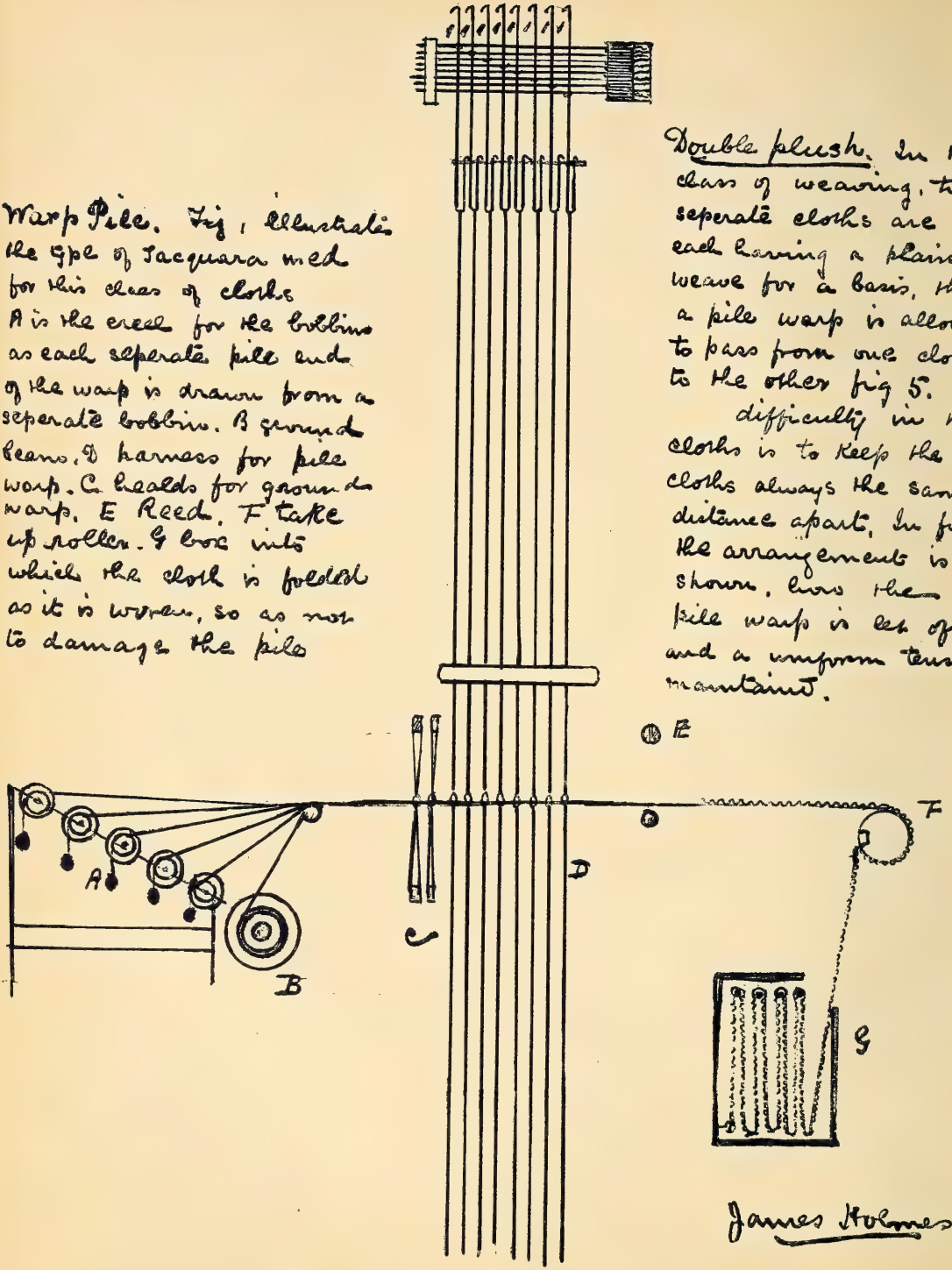


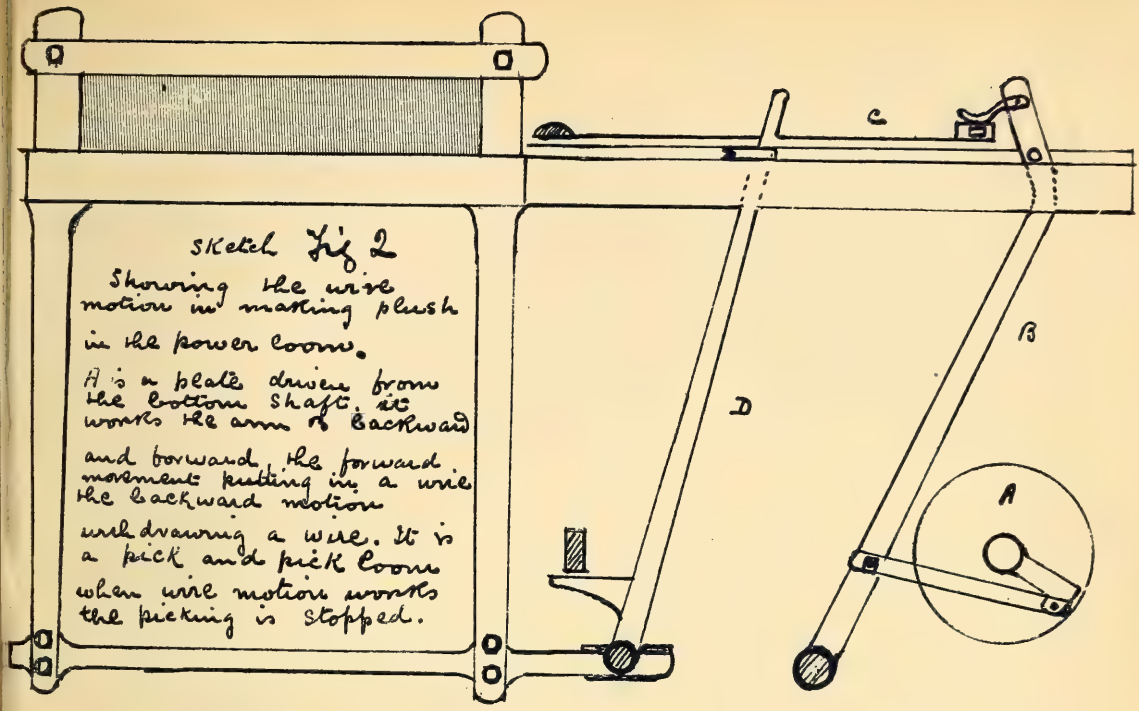
Fig F

Warp Pile. Fig 1 illustrates the type of Jacquard used for this class of cloths. A is the creel for the bobbins as each seperate pile end of the warp is drawn from a seperate bobbin. B ground beam. D harness for pile warp. C heards for ground warp. E Reed. F take up roller. G box into which the cloth is folded as it is woven, so as not to damage the pile



Double plush. In this class of weaving, two seperate cloths are woven each having a plain weave for a basis, then a pile warp is allowed to pass from one cloth to the other fig 5. the difficulty in these cloths is to keep the two cloths always the same distance apart. In fig 4 the arrangement is shown, here the pile warp is let off and a uniform tension maintained.

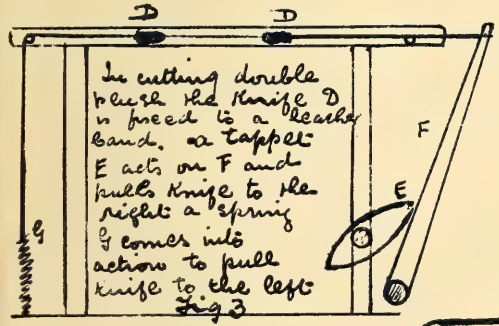
James Holmes



Sketch Fig 2

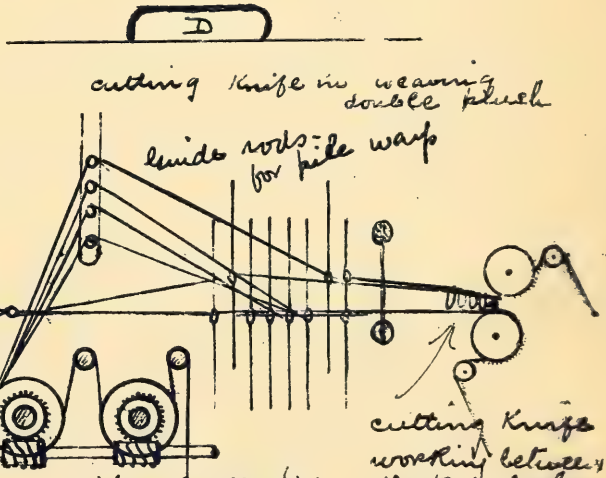
Showing the wire motion in making plush in the power loom.

A is a plate driven from the bottom shaft. it works the arm B backward and forward. the forward movement putting in a wire the backward motion withdrawing a wire. It is a pick and pick loom when wire motion works the picking is stopped.



In cutting double plush the knife D is freed is a flexible band. a tappet E acts on F and pulls knife to the right a spring G comes into action to pull knife to the left

Fig 3



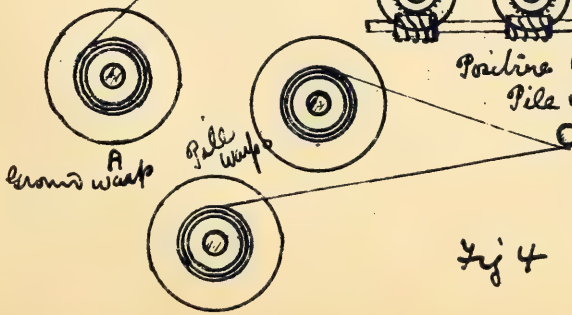


Fig 4

Fig 5

James Holmes

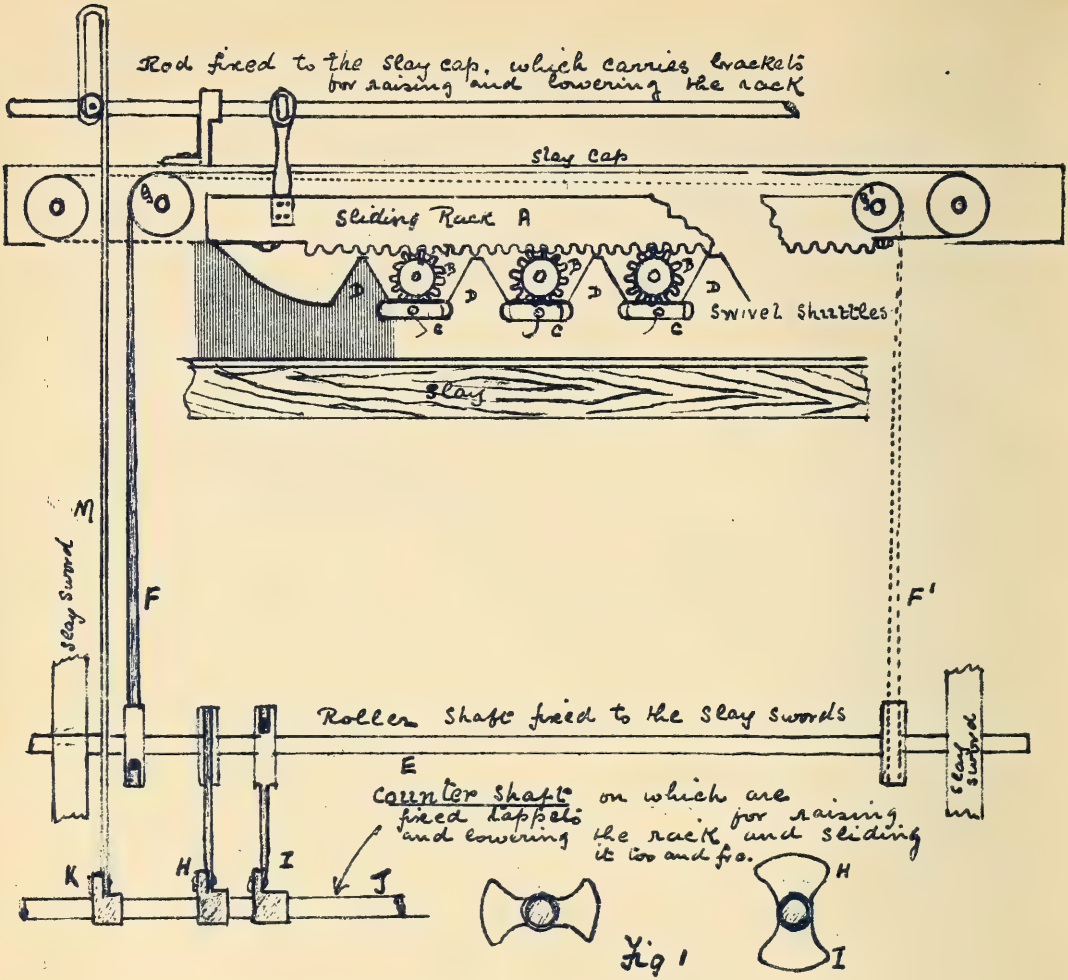


Fig 1

Fig 1 Shows the arrangement of the swivel shuttles in the lay. It consists of a sliding rack A fixed to a frame which can be raised and lowered as required. a reciprocating motion is given to the rack, the teeth of which engages with small pinions B, the movement of the pinions is transmitted to the shuttles C moving them across the openings D. the pinions are never out of gear with the shuttles this ensures a positive motion. A roller shaft E is fixed to the slay sword of the loom (figs 1 and 2) connected to the roller are straps F and F' these pass over guide pulleys G and G' and are attached to the rack; the roller E is given a rotary motion first in one direction and then the other the same as the top rollers for heards in a plain loom this is brought about by a pair of tappets H and I fixed to a counter shaft J (figs 1 and 2) The revolving of the tappets gives the required reciprocating motion to the rack.

The raising and lowering of the rack is also worked through a tappet and lever from the counter shaft. the tappet K acting on the lever L fig 2. pulls down the rod M the rack A then falls with its own weight bringing the swivel shuttles into a working position. when the tappet ceases to act (fig 2) the spring N lifts up the lever and consequently the rack with the swivel shuttles out of the way for the ground shuttle to work.

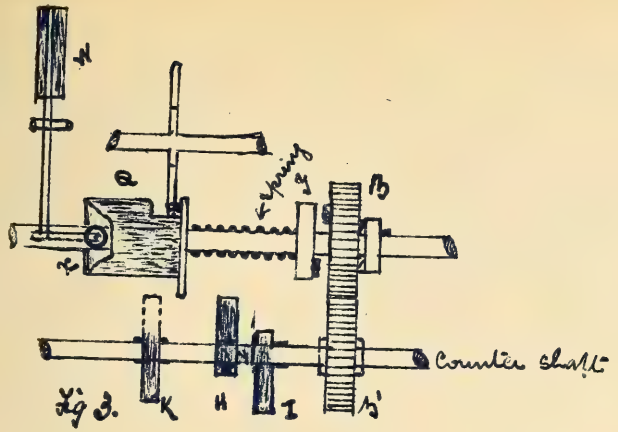


Fig 3.

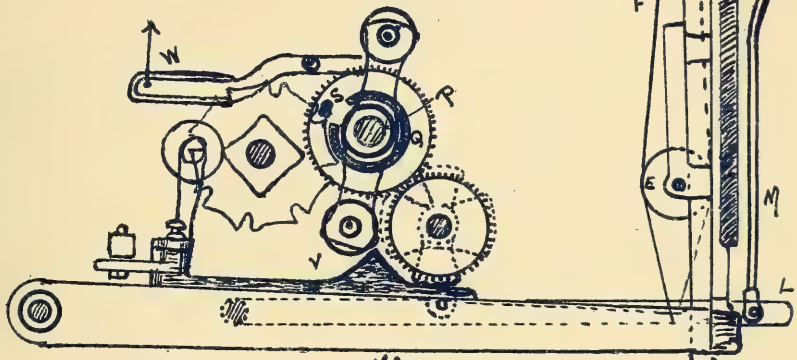


Fig 2

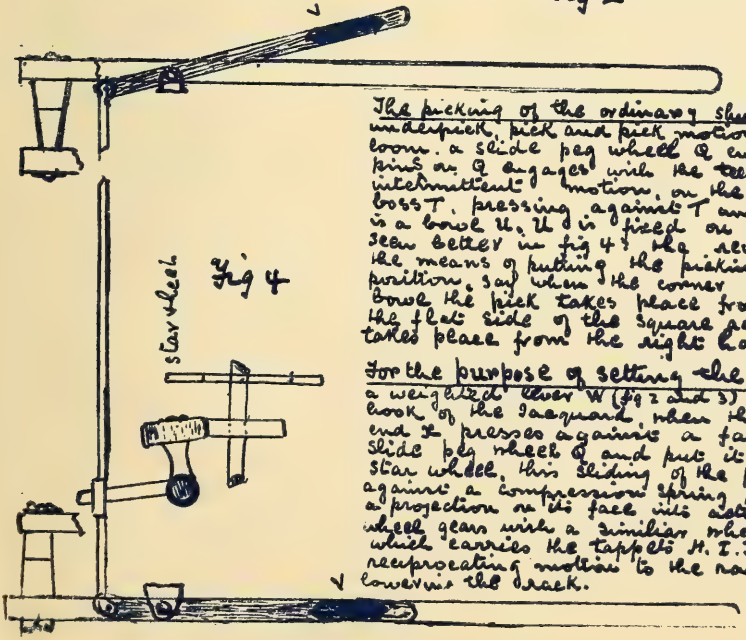
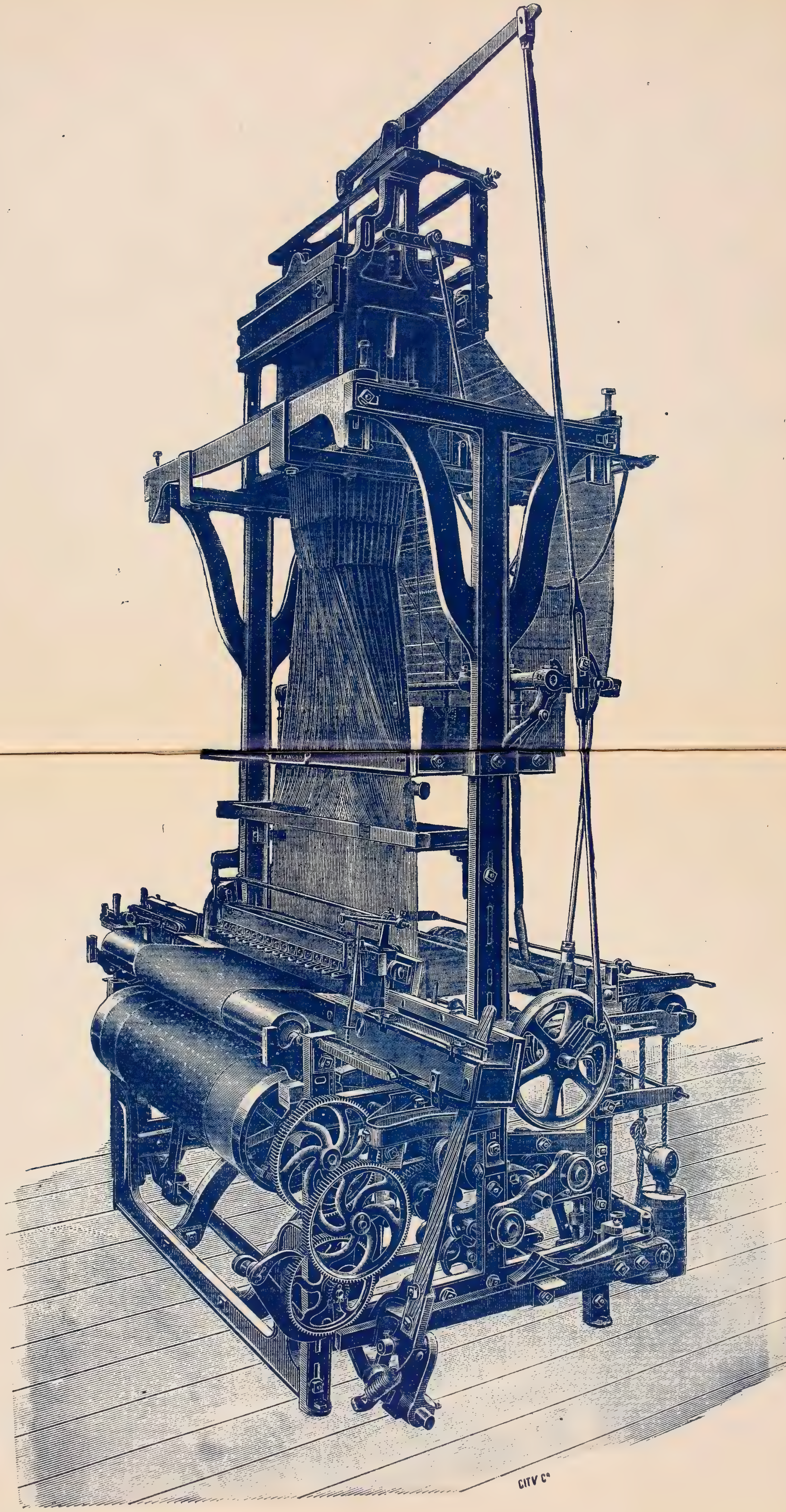


Fig 4

The picking of the ordinary shuttle is controlled by an underpick, pick and pick motion; on the bottom shaft of the loom, a slide peg wheel Q engages with a star wheel R, a pin on Q engages with the teeth of R and gives to it an intermittent motion, on the same stud as R is a square boss T, pressing against T and kept in contact by a spring is a bowl U, U is fixed on the end of an elbow lever, seen better in fig 4, the revolving of the star wheel is the means of putting the picking saddles V alternately in position, say when the corner of the square acts on the bowl the pick takes place from the left hand side, when the flat side of the square acts on the bowl the pick takes place from the right hand side (fig 4)

For the purpose of setting the swivel motion in action a weighted lever W (fig 2 and 3) is connected to a spare hook of the jacquard, when the lever is lifted the other end L presses against a face cam surface of the slide peg wheel Q and puts it out of action with the star wheel, this sliding of the peg wheel along the shaft against a compression spring puts a sliding boss y with a projection x in the face into action with the wheel B, this wheel gears with a similar wheel B' on the counter shaft which carries the tappets H. I. K used for giving a reciprocating motion to the rack, also for raising and lowering the rack.


HEYWOOD
CITY C°

Honours General Syllabus

① The nature and properties of the different fibres used for manufacturing purposes, and the method of distinguishing one from another.

Fibres are very varied in their character briefly they are vegetable or animals. amongst the first named are the following

Cotton. this is the fiberous covering of the seed of the cotton plant. it is cultivated over large tracts of the world in countries lying 45° North and 35° South of the equator: the length of the fibre varies from ½" to 1·8 inches in length. the best cotton "Sea Islands" is grown in South America. and the proveti Surats" in India; when seen through the microscope a fibre of cotton appears like a twisted ribbon. it lends itself very readily to the process of spinning and makes an even well twisted thread.

Flax. Linen. flax is the fiberous tissue of the flax plant. the length of fibre is much longer than in cotton. and on that point it can easily be distinguished from cotton

China Grass. Ramie is the bast fibres of various foreign nettles. it has been extensively experimented with during late years. and is now employed in the manufacture of cloth. its nature is much the same as linen

Jute is the bast fibre of several kinds of plants (corchorus capsularis) the length of fibre is very long in some cases 100 inches

Manila Fibre is the bast fibre of a plant coming from East India it is largely used for rope making. the finer sorts are used for weft for coarse upholstery goods

Cocoa-nut Fibre is the reddish brown fibre surrounding and enveloping the shell of the cocoa nut, largely used in making mats

Wool is the natural covering of sheep. it is curly, warm. and lustrous and adapts itself well to the spinning processes. in an examination of the fibre through the microscope it appears to made up of tubular overlapping scales with the outer edges of the fibre irregular. the colour is generally white or yellow. there are exceptions

Mohair Wool is the hair of the angora goat, it has a silky lustre and is of considerable length in the fibre

Alpaca Wool this is a very fine wool not quite so lustrous as mohair

Shoddy or Mungo is the short stapled wool recovered from the long stapled varities. it is sometimes mixed with cotton

Worsted is a short stapled wool fibre

Camel Hair is used for making driving belts. also for making "Jaeger" cloth

Horse Hair is used for making cloths for upholstery

Silk is the product of the silk worm, it is the fiberous covering of the cocoon that the insect surrounds itself with when passing into the chrysalis state. from which it emerges as a moth.

the microscopical structure of a silk fibre resembles a long transparent glass rod

Mercerized Yarn. is cotton yarn which has passed through a chemical process. which gives cotton the outward appearance of silk

Tests. one of the readiest tests between cotton and wool is to burn a small portion of each. the cotton burns freely leaving no ash, wool burns with faint smell like burnt horn, and leaves a small cinder of ash; for a mixture of cotton and wool, boil the sample in a weak solution of Ca Soda. the wool is dissolved and the cotton left intact

Cotton and linen these can generally be distinguished from each other by the length of the fibres. if a chemical test is required, boil the fibres in water dry, dip them in a strong solution of common salt and sugar, the fibres are then burnt over a flame, linen leaves a grey ash, cotton a black ash.

Silk and Wool These burn somewhat similar, but in silk there is no smell

System of Counting

Cotton 840 yds = 1 hank, 7000 grains = 1 lb. the number of hanks per lb. = counts

Wool There are a great number of system for wool counting

Yorkshire Skein System 1536 yds weight 6 lbs = 1^s cts. Worsted 560 yds = 1 lb = 1^s cts
West of England 320 yds (1 hank) 1^s cts. Dewsbury number of yds in 1 oz = 1st cts
Galashiels 300 yds weight 24 ozs = 1^s cts. Sowerby bridge 80 yds = 1 dram = 1st cts
Hawick 300 " " 26 " = " ". American run 1600 yds = 1 lb = 1^s cts

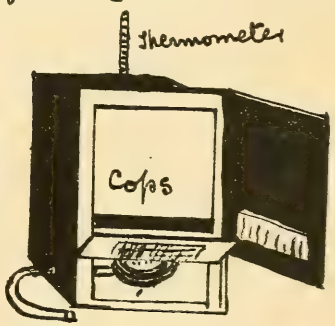
linen 300 yds weight 1 lb = 1^s cts

Silk (Spun) 840 yds (1 hank) = 1^s cts. number of hanks per lb gives counts.
Dram System 1000 yds weighing 1 dram = 1^s cts. the number of drams per 1000 yds = cts.
Denier System. the number of deniers in a hank of 446 metres.
a denier = 533 deniers = 1 oz. a metre 39.37 inch the English equivalent is 520 yds hank weighing = 821 grains = 1^s counts.

Yarn testing. the usual method of testing yarn for the counts, is to measure off a certain fixed length on a wrap reel say 4 leas = 480 yds for cotton, weigh it, and divide the weight in grains into 1000, tables are specially prepared which give at a glance the counts. this saves time in making the calculation.

For the breaking strain test a machine is used provided with two hooks, a portion of a hank is placed on the hooks which are then caused to separate stretching the yarn, a clock and indicator gives the tension in lbs when the yarn breaks.

In testing yarn for moisture specially constructed ovens are used, and by their use the amount of moisture in any fibrous moisture can be exactly determined, they are heated by gas. Example Weigh 10000 grains (cops) put in oven heat to 140 to 180, allow to remain 5 hours, when it is weighed dry add 500 grs = 5% to bring it up to Spinning room standard, the difference is superfluous moisture



Weight put in oven 10,000 grs
When taken out 9,000 + 500 = 9500 grs difference = 5%

James Hibbert

Honours General - cloths (2)

" Items to be considered before selecting the reed and pick counts and weave of any cloths for given purposes. "

First consider for what purpose a cloth is to be used, for example a cloth intended for cord trouserings will be different in reed, pick counts and weave from a cloth intended for dress goods; so that the items you will consider are the reed, a fine reed is usually used for fine counts of material also many picks per inch generally accompany a fine reed, these are used for Sateens, fine dress goods, fine linen, and fine piques: notable exceptions are Fustians and Velveteens, a coarse reed is used with a large number of picks per inch to give the requisite weft pile; coarse reeds and few picks per inch generally go together, as in the case of Towels, many pile cloths, and a large number of cloths intended for domestic purposes.

Another item to be considered is the purpose for which the cloth is intended to be used: Many cloths intended for decorative purposes as Madras muslins are very light in texture, whilst others such as Decorative Tapestries are made very strong and compact; generally the purpose for which a cloth is intended to be used determines the strength of the yarn and the compactness of the weave, example, many mens shirtings are made with a warp satin face, on account of the warp being of stronger material than the weft, the warp satin weave brings to the face a greater preponderance of warp, which offers a better wearing surface, also in Turkish towels the pile warp is of a much more spongey nature than the ground warp, so that it readily absorbs moisture and acts like a sponge.

Clause 3 is a continuation of clause 2 and reads as follows

" The selection of warp and weft yarns specially adapted to the various types of pile and other fabrics, intended for decorative purposes, also for Vestings, Suitings, dresses, mantles, Quiltings, and Tapestries Another a number of examples of the different types of cloth are here given. "

Pile cloths, weft pile when the floats of weft are cut as in Fustians and Velvets warp 2 or 3 fold 20^s (cotton) Weft 50^s or 60^s good colour and clean. Reed about 40^s Picks 150 to 350 per inch

Pile cloths when made by the warp without the aid of wires as in Terry - Warp (ground) 20^s to 30^s Terry warp 2 or 3 fold 20^s lightly twisted or sometimes a coarse 10^s soft spun single yarn Weft 10^s to 20^s. Reed 40^s to 60^s; Picks 40 to 60 per inch

Pile cloths when made by the aid of wires, railway carriage seating and upholstery cloths. The materials are various cotton weft and ground warp with wool warp for pile.

The counts of Reed & picks vary generally coarse say 60 x 60

James Hollings

when for velvets and figured dress goods, the warp and weft is generally fine counts with a silk warp for the pile warp.

Suitings a large quantity of suiting cotton cloths are woven in coloured for the south american trade. they are light and suitable for warm climates warp 16^{s} 3/4 reed weft 20^{s} Reed 60^{s} Pick 18; Suitings for use in England are generally mixed goods from cotton worsted and wool.

Vestings, if white, are made in the style of Pique cloths or mat weaves. with padding weft, generally cotton with small silk weft or warp spots Reed 80 picks 80 these will vary depending upon the counts of the materials used

Vestings Black and coloured. fibres mixed. In some examples may be found, a black cotton warp, Wool, weft, with alpaca weft for showing up a lustrous spot, and silk weft for showing up a coloured spot.

Dresses These may be made from any material or a mixture of any two or three. If for printing they are generally made in cotton and some beautiful effects can be obtained by printing coloured spots on a rich black sateen ground. Silk spots on plain grounds, checks, combination weaves as tappet and Leno. Silk goods. Silk and wool as in poplins.

Mantles. there are a mixture cloth. if the warp is not required to show. a cotton warp & silk or wool weft is used. If the warp is brought prominently to the face, then a cotton weft or silk or wool warp

Quiltings there are of various kinds as Honeycomb quilt a cloth made from coarse yarns. Alhambra quilts a kind of double plain weave, patent or Satin quiltings, and those made with padding weft with a plain face, the back warp coming up for stitching and making figure

Tapestries the materials are cotton, wool, or a mixture of cotton wool, silk and Jute Reeds from 30^{s} to 80^{s} picks 30^{s} to 80^{s}

Damask. a cloth with a warp & weft satin ground and figure. cotton warp & weft in the better kinds, wool warp & weft Reed 40^{s} to 80^{s} Picks 40 to 80. A number of questions from exam. papers are here given which bear on these clauses.

1) What is the primary object to be attained when a 5 end warp satin is used for making a cloth for mens shirts. for what purpose would you introduce a weft face satin weave. Give the Reed & picks. counts of warp & weft for each kind. 1899

2) What reed, pick and counts, quality and nature of warp and weft yarns would you select for the following - Cotton sheeting - Jerry towels, Damask dress material Vestings and cotton trouserings 1900 James Holmes

3) What object would you keep in view in selecting yarns for each of the following Flannelette, Dresses, Velveteens, Tapestry table covers. Briefly state the nature of cloth structure adapted to each type of fabric named 1901

4) Write out a check design. give reed and pick twist & weft for a backed fabric for a dressing gowne to weigh 18 ozs per yard 54" wide 1901

5) Give the Reed, picks counts & weave in each case for fine shirting having neat and clear stripes giving it the appearance of a printed fabric - Ladies unlike blouse & washing material for servants dresses. Workmans cotton trouserings 1902

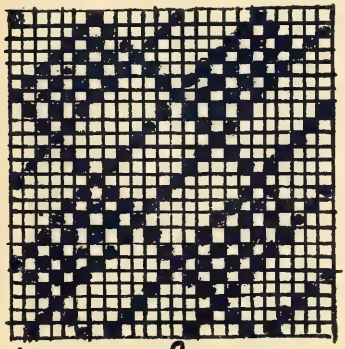
Honours. General Syllabus

Clause 4. The structure and analysis of all descriptions of compound fabrics intended for vestings &c.

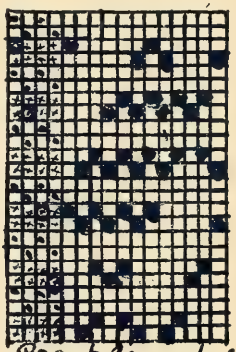
In the making of backed cloths generally the back weave is of a simple character, and serves as a foundation for the face weave, the back weave may be of a light character fine warp and fine weft, or it may be of a heavy character when it is intended to serve as a lining to a material. A few examples are given here with a ground weave of two ends ground one end face; the face ends weaving with a good thick wool weft and making the figure on the face, a firm weave with weft floats for figure being maintained in order to make a full cloth. In the back cloth a fine weft is used. Four healds are used for the ground, and 12 healds for the figure; when a pick goes into the face cloth all the ground warp is left down, also when a pick goes into the back cloth all face warp is lifted, this will mean a very heavy lift on back picks, it is better therefore to weave the cloths the wrong side at the top, therefore lift all ground warp on face figuring picks. In binding the two cloths together leave down a ground end at intervals on face figuring picks. The woven samples must be afterwards dyed suitable colours.

Try the effects with the take up motion stopped on fine back picks (Round)

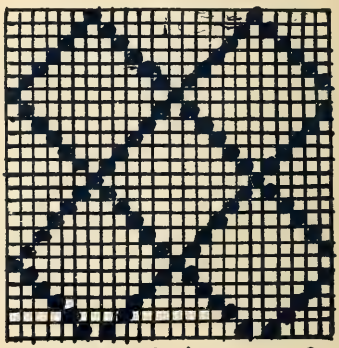
James Sykes



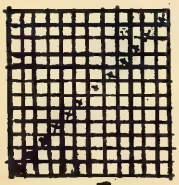
E looming A



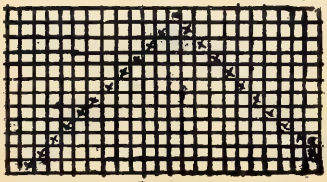
Peg plan for A



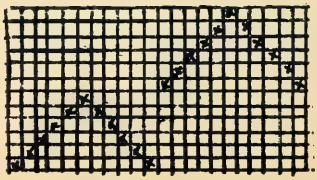
Basis of design A.B.C



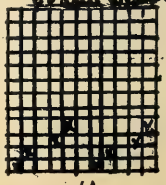
E



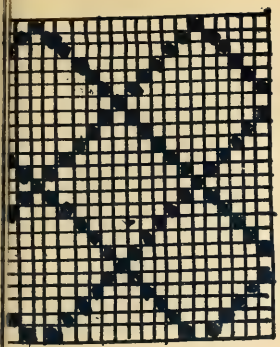
F



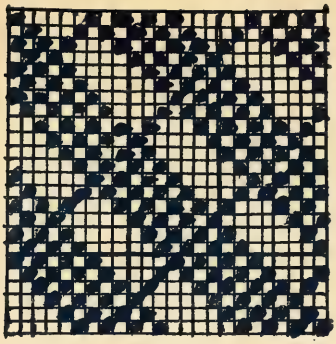
G



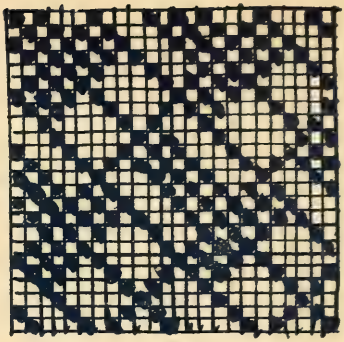
H



Make a design of your own on this basis



B
E Loosing



C
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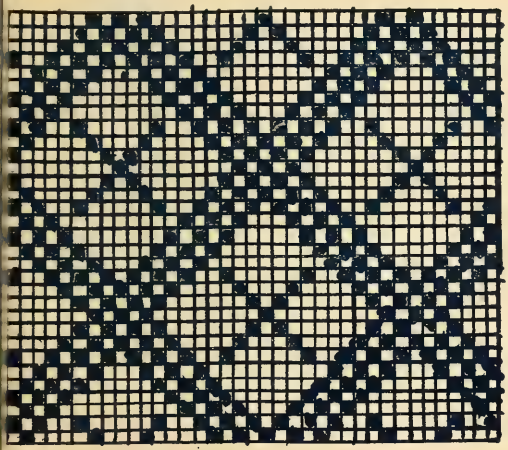

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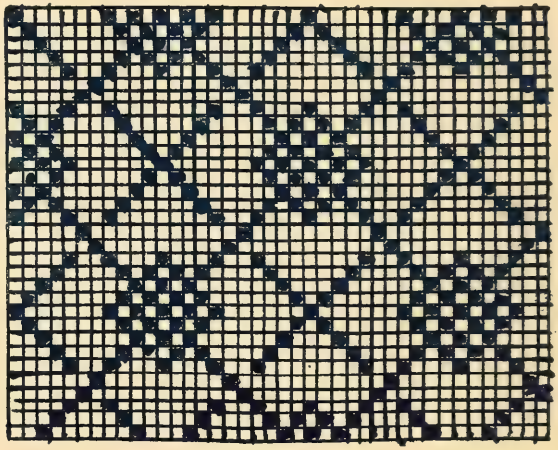

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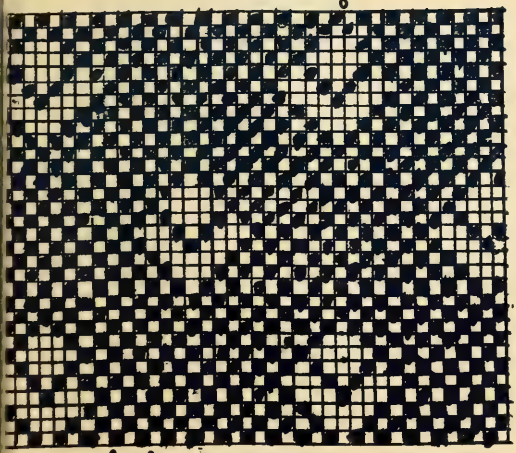
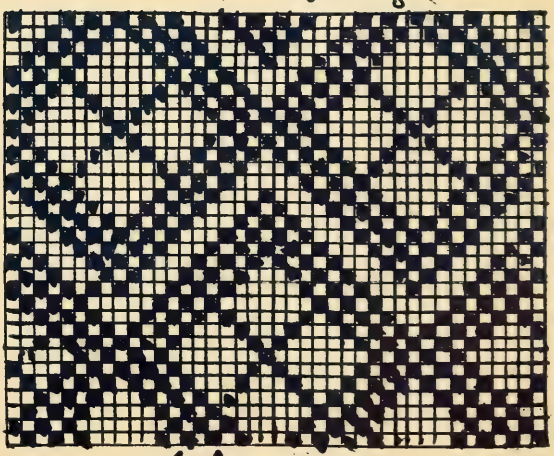


G Loosing

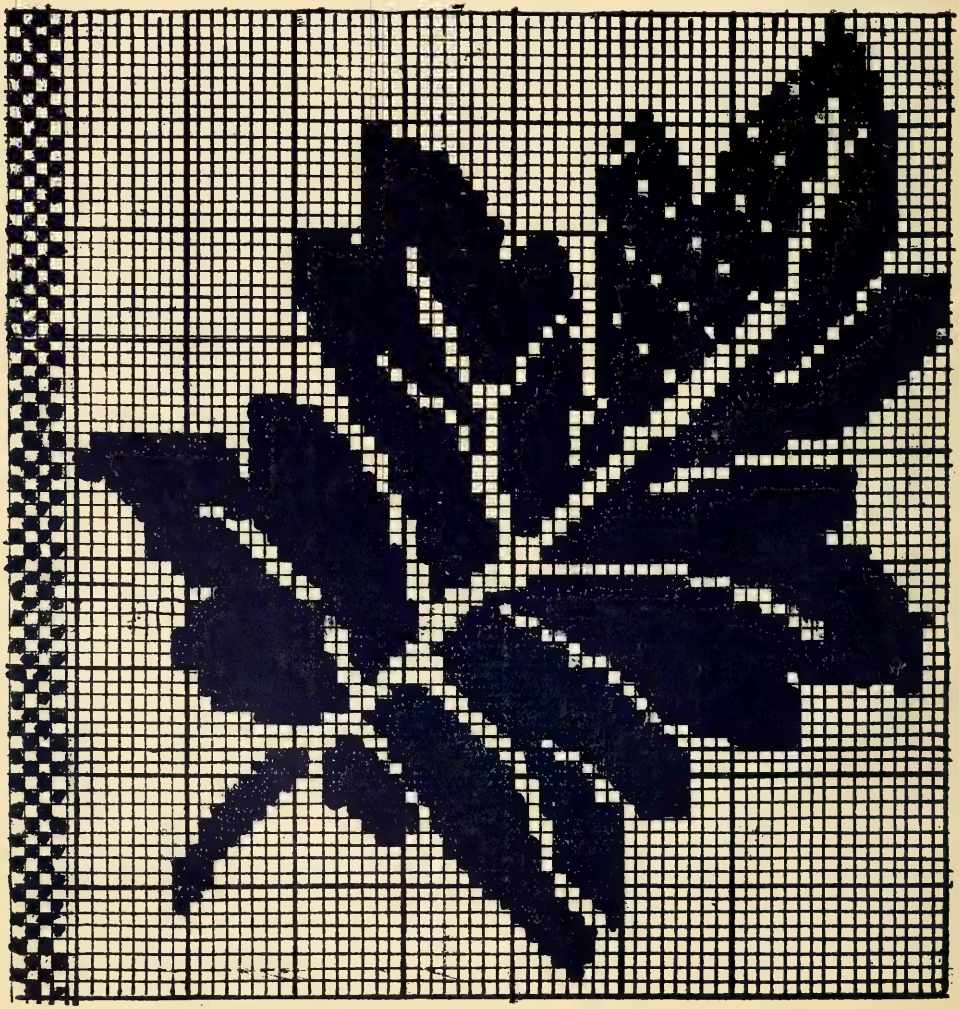


G Loosing

James Hopkins

Schemes of Pattern development and cloth structure suitable for heavy single ply Quiltings

Answer. A large number of quiltings are made by using a Jacquard and a set of healds working in front of the harness; the ground warp is drawn through the healds and they weave plain cloth a very thick coarse weft being used. The figuring warp (coloured) is drawn through the Jacquard harness, the arrangement being 1 ground 2 figure or 1 ground 2 or 3 figure, the ends drawn through the harness are generally 2 or 3 in one mail eye this gives a full effect to the figure. Below is given a sample of the type of named, showing how the figure is worked up

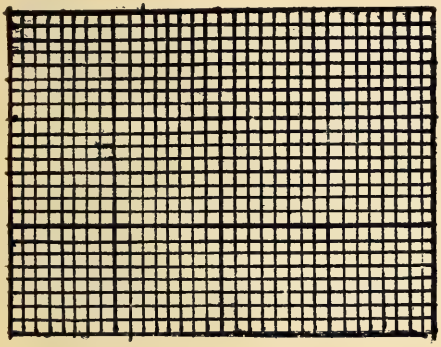


James Holmes

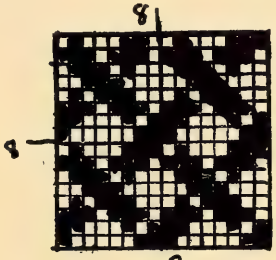
Designing of backed fabrics

These cloths have one design on the face and another of a different character on the back; they are generally fabrics of a heavy character, and intended for either reversible cloths, or for wearing purposes as articles of clothing. A fustian and a velveti are both backed cloths, generally the backing is a twill weave, the face weave being of a weft floating character, and when the floats of weft are cut the brush like surface is obtained characteristic of these cloths.

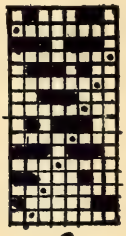
The back weave is generally a twill, a satin or some such simple weave, with one warp and one weft or 1 warp and two wefts, the wefts being of different counts or of different colours. These cloths to be effective must contain double the number of picks, to what are used for single cloths of like design.



J



A



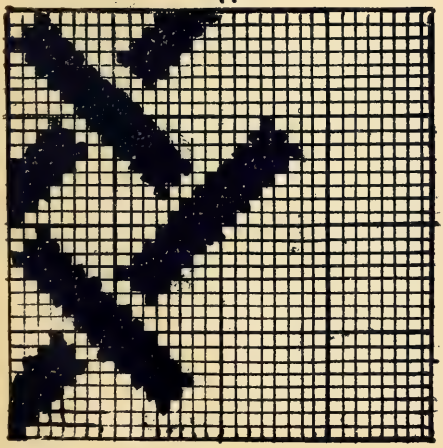
C

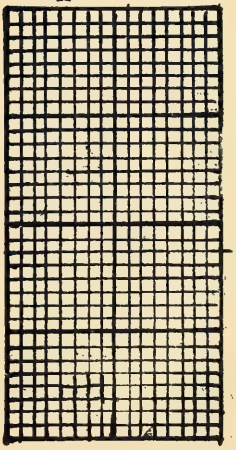
B

E

D

H





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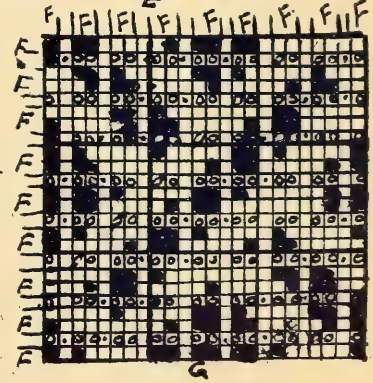


G

James Hothersall.

On the space J give design & peg plan for fustian cloth supplied. C gives A backed with B. Complete H and on space I back it with B. G is a double cloth E face D back & stitching of the two cloths together

Honours. General Syllabus

Clause 5. Patent and other defects in fabrics caused by faulty preparation of the warp, or faulty construction and unequal balancing of warp and weft.
Calculations relating to cloth structure
A number of questions have been given in the City Guilds of London exam. papers. These will be taken as types and answers given.

1901 (a) Name some common defects frequently found in fabrics, and due to faulty construction. (b) Criticise the balancing of the warp and weft in the following and state how you would improve the same.

(c) A grey 5 shaft sateen weft face shirting	30 ends	20 picks per ¼"	14^s Twist	20^s weft.
(d) A striped 5 shaft sateen warp face shirting	20 "	20 "	30^s "	14^s "
(e) A check harvard shirting 2 by 2 twill	14 "	18 "	20^s "	20^s "
(f) An all over leno brocade	20 "	30 "	50^s "	12^s "
(g) A Turkish towell 56 ends per 1" ground			16^s	
112 " " piece		88 "	32^s	12^s

ANSWER. (a) ends down. floats " thick and thin places. uneven weft. thick places or snarles in the warp yarn. bad selvedges. In coloured goods shadey weft. In jacquard and dobby cloths faulty construction of the pattern causing the warp and weft to show in lines. too many or not enough ends & picks per inch. weft or warp too fine or coarse.
(c) use 20 ends 30 picks per ¼". (d) use 14^s Twist 30^s weft.
(e) use 16 ends 16 picks " " (f) use 50^s " 50^s " 20 ends 20 pks ¼"
(g) use 56 ends 1" ground 32^s twist 70 picks per 1" 18^s weft.
use 56 " 1" pice 16^s "

1901 (a) If 80 threads and picks of 20^s twist and weft are considered to produce a perfect fabric when woven 2 by 2 twill how many threads and picks would you use for a 3 up 3 down 1 up 1 down twill also if woven plain calico (c) If you desired to change the counts instead of the weave what counts would you adopt in each case? (d) upon what principle is a perfect structure of cloth based?

ANSWER (a) carry both patterns out to 20 ends each, the number of ends & intersections in each one will be

2 and 2 twill ●●●●●●●●●●●●●●●●●●●● 20 ends + 10 intersections = 30
The other twill ●●●●●●●●●●●●●●●●●●●● 20 " + 12 " = 32

Therefore $\frac{30+32}{2}$ = 75^s ends and picks required

(c) In 4 end twill ●●●● = 4 ends + 2 intersections = 6 Therefore $\frac{80\times6}{8}$ = 60 ends & picks
In 4 ends plain ●●●● = 4 " + 4 " = 8

(c) The square root of 20^s = 4.47, therefore in
(a) $\frac{4.47\times80}{75}$ = 4.76 and 4.76^2 = 22.6^s (c) $\frac{4.47\times80}{60}$ = 5.96 and 5.96^2 = 35.5^s

(d) The thickness and the number of ends and picks in a perfect cloth are such, that each end and pick are lying close to each other without any compression

1900 Suggest what nature of defects and faulty construction would be prominently perceptible in the three cloths produced as follows.
(a) a warp sateen from twist with too much size on, and woven under insufficient tension on warp beam or on weft as it leaves the shuttle
(b) a 3 shaft twill woven 60 ends per inch 40^s blue twist and 40 picks per inch 8^s cop weft
(c) 1 2 and 2 twill check woven 80 threads per inch 40^s twist and 48 picks 12^s weft. Warp pattern 12 white, 4 blue. Weft pattern 16 white 4 Blue.

ANSWER (a) This cloth will be rough and harsh to the feel. it can be much improved by weaving the cloth will plenty of weight on warp beams.
(b) with 40^s twist and 8^s weft, the weft will tend to show somewhat prominent and the twist cloth thin and poor I should suggest using a 30^s reed.
(c) The presumed check will be irregular in the warp 80 Reed 12 while 4 blue the width of the white will be $\frac{12}{80}$ = about ¼" wide and the blue ¼ - ⅕ of an inch wide
In the weft the 48 picks per 1" 16 white 4 Blue will give checks $\frac{16}{48}$ = ⅓ of an inch wide, $\frac{4}{80}$ = $\frac{1}{20}$ of inch wide for white & Blue

1899 If a 40^s gin cloth with 80 threads per inch of 36^s and 64 picks of 25^s makes a perfect cloth (a) what counts of warp and weft must be used to make a plain cloth equally perfect with 68 threads and 60 picks (b) also what counts should be used if the latter particulars had to be woven 2 and 2 twill instead of plain.

ANSWER (a) sq. rt. of 36^s = 6. $\frac{6\times68}{80}$ = 5.1 and 5.1^2 = 26^s warp. sq. rt. of 25^s = 5. $\frac{5\times60}{64}$ = 4.68 and 4.68^2 = 21.9^s
(b) in 4 ends plain ●●●● there are 4 ends + 4 intersections = 8
in 4 " twill ●●●● " 4 + 2 " = 6

James Holmes.

∴ $\frac{5.1\times6}{8}$ = 3.8 and 3.8^2 = 14½^s Twist also $\frac{4.68\times6}{8}$ = 3.5 and 3.5^2 = 12¼^s weft

1898 Supposing 72 threads and picks per inch of 36's count produced a perfectly satisfactory cloth in calico weave (a) how many ends and picks could be put in a 2 and 2 twill with equal perfection? also what counts of yarn should be used in a calico weave with only 60 threads and picks per inch

ANSWER (a) The ends plus intersections in plain = ends + picks = 4 + 4 = 8
The " " " twill = ends + picks = 4 + 2 = 6
∴ $\frac{72 \times 8}{6}$ = 96 ends and picks required

(b) The square root of 36 = 6 ∴ $\frac{6 \times 60}{72}$ = 5's and 5^2 = 25's counts.

1898 Where would you look for the cause of the following faults in cloth, and how would you seek to remedy them.
(a) Thick and thin places and cracks, (b) wavy or crimped selvedges.
(c) Broken picks, (d) Reediness, (e) Floats, (f) oil spots.

ANSWER. (a) weight ropes or chains binding and catching of the warp irregular, Crank arm loose. (b) Weft coming too freely from the shuttle, put a little drag on, ends taken up wrong, heards shedding imperfect. (c) weft fork too heavy or touching the sides of the grid, bad picking causing the shuttle to chop the weft in the shuttle box. (d) Having both the sheds the same tension when beating up. Lift up the back shaft or lower the heards beat up the weft in open shed. (e) Threads becoming entangled in the warp between the heards and the reed, (f) Oil falling from the bearing of the driving shaft overhead crank arm too much play, oil picking bands.

1898 (a) and (b) the following defects took place in the preparation of a warp what would be their probable effect.
(a) If the warper made the sections unlevel in diameter,
(b) If a beamer does not build up the warp solid against the flange, or put it on the beam too soft
(c) If a drawer put the warp narrower in the heards than the reed
(d) If twister hand leers. (e) If the yarn be overdried in spinning
(f) If not sufficient size on. (g) If a weft or warp yarn had too much or too little twist in.

ANSWER (a) If the sections are unlevel they would not make a weavers warp from them, as the different diameters of sections would let the warp at different rates. (b) The ends would fall down between the warp and the flanges at the side. If soft all the way across it would wind off badly at the slasher. (c). The warp would be pulled at each side and the fraying action of the reed will rub the nature out of the yarn. (d). The number of ends in the half leer which we will assume is 20 will come up twisted and difficult to weave throughout the weavers warp. (e) The yarn is harsh and breaks with little strain, (put a wet cloth on) (f) Soft and rubs into lumps between the reed and the heards and difficult to weave (g) warp yarn rubs into lumps between the heards & reed and if woven with much weight on the ends are constantly dropping down. weft yarn will give good cover to the cloth but will be constantly breaking.

1896 (a) Taking the diameter of 70's as $\frac{1}{230}$th of an inch what will be the counts of a thread whose diameter is $\frac{1}{308}$th of an inch? (b) if with 70's warp and weft a plain cloth is being woven 26 × 30 to the quarter inch what number of ends of the other thread must be used for a 2 and 2 twill to give a cloth of equal firmness

ANSWER. (a) Square root of 70 = 8.36 ∴ $\frac{8.36 \times 308}{230}$ = 11.2, 11.2^2 = 125's

(b) With 70's warp and weft a cloth is woven with 26 ends and 30 picks per ¼" or 104 ends and 120 picks per inch, if 125's counts are used the number of ends and picks in plain will equal

$\frac{104 \times 11.2}{8.36}$ = 139 threads $\frac{120 \times 11.2}{8.36}$ = 161 picks

this plain cloth using 125's is changed to a 2 and 2 twill the number of ends and picks per 1" equals

2 over plain 4 ends + 4 intersections = 8 ∴ $\frac{139 \times 8}{6}$ = 185 ends $\frac{161 \times 8}{6}$ = 214 picks
2 under twill 4 " + 2 " 6

Diameters of yarns. To find the square root of the number of yards in a ℔ weight and deduct 10%

For working square root see dia. of yarns.

Thus dia of 36's = sq. rt of 38640 196
"Calculations in Cotton Weaving" 36 × 840 = 38640
196 less 10% 177
∴ dia = 177 of an inch

James Holmes

Calculations involved in determining the departmental and total cost of production from given data.

For the purpose of elucidating this clause a number of worked out examples will be given.

Example. What would be the cost per yard for 10 000 yards of cloth from 10 500 yds of warp of the following check fabric, other costs besides those mentioned to be covered by a sum equal to one and a quarter times cost of weaving warp patterns

			$	₫
24	Pink	30^s at	1	- 2
6	white	40^s "	1	- 3
2	sky	30^s	-	11
2	white	40^s	1	- 3
4	Pink	30^s	1	- 2
6	white	40^s	1	- 3
48				

To be checked same patterns as warp but all 40^s weft at 11^d per ℔ for colours and 10^d per ℔ for white. 36 inches wide and 76 ends per inch in reed. 72 picks per inch.
Winding warp 1^d per 25 hanks. Winding weft 1^d per 18 hnks
Warping 10^d per 1000 hanks Weaving 3^d per inch per ¼ inch for 105 yds of warp.

ANSWER

WEIGHT OF WARP. $\frac{36 \times 76}{48} = 57$ repeats

PINK $\frac{28 \times 57 \times 10500}{840 \times 30} = 665$ ℔s

WHITE $\frac{16 \times 57 \times 10500}{840 \times 40} = 285$ ℔s

SKY $\frac{4 \times 57 \times 10500 \times 2 \text{ fold}}{840 \times 40} = 142$ ℔s.

TOTAL WEIGHT of WEFT. $\frac{36 \times 72 \times 10000}{840 \times 40} = 771$ ℔s

The proportionate weights of each colour of weft are

PINK $\frac{771 \times 28}{48} = 450$ ℔s

WHITE $\frac{771 \times 16}{48} = 257$ ℔s

SKY $\frac{771 \times 4}{48} = 64$ ℔s

COST

Pink warp	665 ℔s	at	14^d per ℔	=	9310 PENCE
white "	285 "	"	15 " "		4275
Sky "	142 "	"	11 " "		1562
Coloured Weft	514 "	"	13 " "		6682
WHITE	257 "	"	11 " "		2827
Winding warp 34,190 hanks at 1^d per 25 hanks					1367
Weaving 18 picks per ¼ at 3^d per ¼ for 105 yards of warp (10 500 yds)					5400
Winding weft 30 840 hanks at 1^d per 18 hanks					1718
Warping 34,190 hanks at 10^d per. 1000 hanks					341
Expenses 1¼ times weaving					6750
				PENCE.	40227

Cost per yard: $\frac{40227}{10000} = 4.02$

EXAMPLE

What amount of wage would be earned for performing the following

Colour - Winding

(a)	10 bundles	(10 ℔s each)	36^s hanks	1^d per 25 hanks	
(b)	10 "	" "	22^s "		
(c)	10 "	" "	18 " "		

Yorkshire Dressing.

(a)	2 warps	2600 ends	384 yds	5^d per 100 hanks.
(b)	1 "	2100 "	840 "	
(c)	1 "	3224 "	660 "	

WEAVING

(a)	1 piece	132 yds warp.	with 60 picks per 1"	at 4^d per ℔ wieh for 100 yds of warp
(b)	2 "	99 "	" 48 " " "	
(c)	2 "	88 "	" 56 " " "	

ANSWER. WINDING

	℔s	cls		
(a)	100	× 36	= 3600 hanks	
(b)	100	× 22	= 2200 "	
(c)	100	× 18	= 1800 "	
			7600 "	∴ $\frac{2600}{25} = 304^d = £.3.0$

Yorkshire Dressing

(a) $\frac{2 \times 2600 \times 384}{840} = 2377$ hanks

(b) $\frac{1 \times 2100 \times 840}{840} = 2100$ "

(c) $\frac{1 \times 3224 \times 660}{840} = 2533$ "

7010 ∴ $\frac{7010 \times 5}{100} = 350^d = 1 : 9 . 2$

WEAVING

(a)	$4 \times 15 \times 132 \frac{1}{2} \div 100 =$		79.2
(b)	$2 \times 4 \times 12 \times 99 \div 100 =$		95.5
(c)	$2 \times 4 \times 14 \times 88 \div 100 =$		98.5
			272.2

$= 1 - 2.8\frac{2}{4}$

Example. Assuming a square yard of cloth to weigh 4 ounces what percentage of size would you put on 36's twist in order to obtain that weight when woven with 30's weft. What will be the cost of a piece 38 inches wide 38½ yards long (on the counter) with yarns at an average price of 6 5/8d in the cop, weaving 8½ other expenses not including sizing 9d

ANSWER 1st part of question assuming that cloth contains 52 ends and 60 picks per inch

The weight of warp equals $\frac{38" \times 52 \times 160}{840 \times 30} = 1.2544$ ozs

Weight of weft equals $\frac{38" \times 60 \times 16}{840 \times 30} = 1.4447$ ozs.

The total weight = 1.2544 + 1.4447 = 2.701 ozs.
Sample weighs 4 ozs ∴ 4 ozs less 2.701 = 1.299 Size.

$\frac{1.299 \times 100}{1.254 \text{ wgt of warp}} = 103.6$ per cent.

2nd part of question allow 5½% for length 5½% for width and 4% waste for weft.

Warp $\frac{38" \times 52 \times 40}{840 \times 30} = 3.14$ lb at 6 5/8d per lb = 20.8

Weft $\frac{40" \times 60 \times 38\frac{1}{2}}{840 \times 30} = 3.66 + 4\% = (.14)\ 3.8$ lb at 6 5/8d per lb = 25.1

= 8.5

Weaving expenses 9

5/3½ 63.4

Example. Calculate the cost per yard of 1000 yards of cloth from 1080 yds of warp to the following check fabric, other costs besides those mentioned to be covered by a sum equal to 1¼ times the actual cost of weaving

WARP PATTERN

16 light blue 2 in a dent 20's twist at 1/8 per lb for yarn, dye and size
1 fancy 3 fold Brandrelle } 1 thread 30's yellow 1-2 per lb
in one dent composed of } 1 " 20's white 1-0 " "
4 light blue as above } 1 " 24's Red 1-1 " "
1 fancy 3 fold as above
16 light blue as above
8 white 2 in a dent 36's at 1-3d per lb bleached
4 Pale sky 2 in a dent 30's at 1-3d " " Dyed
8 white as above.
56 = 30 dents.

To be checked same patterns as warp but all 40's weft at 1-1d per lb for colours 11d per lb for white; and 2 picks of 40's red and white print at 3/4d per lb in place of one thread Brandrelle 36" wide, 60 ends per inch in reed; 60 picks per inch, winding warps 1d per 25 hanks, winding weft 1d for 18 hanks warping 10d per 1000 hanks. Weaving 3d per pick per ¼" for 105 yds of warp.

It is somewhat difficult to give a rule for estimating the expenses for the cost of a piece of cloth, the condition of manufacturing are different in different districts, and even different in the same district. In north east Lancashire it is usual to add 1d per lb to the warp and afterwards for general expenses and management add both the weaving price. In any other trade than plain cloth this will not pay and in the coloured trade whole weaving at least must be allowed; in the fancy coloured trade more than this must be allowed

I think it a good idea to base the general expenses on the weaving price and for that purpose an example is given below The weaving price is 50 pence.
For expenses add

Taping, Winding and Beaming	20%	on Weaving	10d
Twisting	3%	" "	1½
Overlookers, Warehousemen Managers	18%	" "	9
Standing charges for Stores Interest on Capital and depreciation	40%	" "	20
			30½
			440½

James Holmes.

Mill Management. # The Grey TRADE

Machinery required. Wages paid. Capacity of each machine in the General management for a Weaving shed of 450 looms 36 inches read space Weaving Burnley Printcloth 58 Reed 32" wide 116 yds 16 – 16 picks per ¼" 32^s warp 50^s Weft. The actual counts of warp used is 34^s but when sized it is equal to 32^s and is sold as such when woven into cloth, is is calculated as 32^s in the Sale of the cloth, for all other purposes it is calculated as 34^s. The weight of warp and weft in a piece equals

$$\frac{\text{warp width in Reed} \times \text{Reed} \times \text{Yards length}}{840 \times \text{32 counts}} = \frac{34" \times 58 \times 122\text{yds}}{840 \times 32} = 9\text{ lbs nearly}$$

Weft

$$\frac{34" \times 64 \text{ picks } 1" \times 116\text{yds}}{840 \times 50} = 6\text{ lbs}$$

Price paid for weaving 7/8^d per piece, assuming that each loom makes two pieces per week which will give an average of 5/4 per loom per week = 900 pieces per week. Pcs lbs The weight of warp yarn required per week = 900 × 9 = 8100 + 8% waste in all departments = 648 Total weight 8748 lbs

Weight of weft Pcs 900 × 6 lbs = 5400 + 5% waste = 270 ∴ total weight: 5670 lbs

WINDING ROOM.

One winder will attend to 40 spindles and at ½^d per lb will earn 16/- per week = 5670 lb of yarn for 40 spindles or 5670 ÷ 40 = 141.2 lbs per spindle. one loom requires 18 lbs of warp yarn per week, therefore allow 1½ spindles per loom or 650 spindles for 450 looms. will produce 650 × 14 lbs 9100 lbs per week. at a cost of £12-0-0 per week.

Avoid Knots (large) waste, uneven bobbins, too much yarn wound on to a bobbin, broken bobbins

BEAMING ROOM

One beamer will make 7½ beams per week per frame, 400 ends 17500 yds 34^s weighs 245 lbs ∴ 245 × 7½ = 1837½ lbs of yarn per frame, assuming 5 frames the production per week equals 1837 × 5 = 9185 lbs which is ample, price per beam 1/11^d Total cost for beaming £3-10-0

attend to the following, see that the beams are proper care when empty. weigh each beam as it comes from the frame, mark on it the no. of ends, length, counts and net. weight. The measuring motion must be kept in perfect order, as the warping of irregular lengths is a source of great waste.

Sizing ROOM.

Say a 5 beam set is used the number of ends 1970 length 17500 yds 34^s weight per set = 1209 lbs 7 sets per week = 8449 lbs which is ample. at a cost of £2-5-0

In the sizing room there ought to be a separate small engine, to enable the attendant to run meal times and overtime when required.

The sizer must be able to make his own mixings, and sizing to the extent of 12% will make the 34^s equal to 32^s and allow a liberal margin for what is rubbed off in weaving

TWISTING ROOM

Four twisters at a cost of £5-0-0 per week.

Warehouse and Day men. 4-0-0 " "

Overlookers are paid 1½^d per £ on the weavers earnings – 450 looms at 5/4^s = £120-0-0 per week at 1½ = £7-0-0

Office and Salesman £5-0-0 per week.

Management 2-0-0 " "

For other expenses a summary is given in detail.

James Holmes

Summary of Expenses.

Winding	12-0-0
Beaming	3-10-0
Sizing	2-5-0
Sizing materials ⅓ of a penny per lb for sizing	12-0-0
Twisting	5-0-0
Overlookers	7-0-0
Stores 2ˢ per loom (to cover everything)	3-15-0
Warehouse 9 day men	4-0-0
Office 2 Salesman	5-0-0
Management.	2-0-0
Interest on capital £4500 on a basis of £10 per loom 6%	4-6-0
Depreciation 5% on £4500	4-6-0
Rent and Power at £1-18-0 per loom per year = 3⅔ per loom per week. 450 looms	16-8-0
Carriage	7-0-0
Insurances ½% per £100	6-0-0
Rates and Taxes.	2-0-0
	£96-10-0

The weaving price for one week = £120 the expenses to cover cost of weaving is £96-10-0 per week the amount per cent to add to weaving to cover cost of expenses =

$$\frac{96.5 * 100}{120} = 80\%.$$

You can obtain as much more as the market will allow, but to accept less than 80% on weaving is to work at a loss.

Summary of Machinery

450 looms. 36" reed spaces

½ winding spindles per loom = 650 spindles for 450 looms
1 winder 40 spindles

1 Beaming frame for 90 looms.
2 men Beamers 2 frames each
1 Leamer

1 Slasher Sizing machine

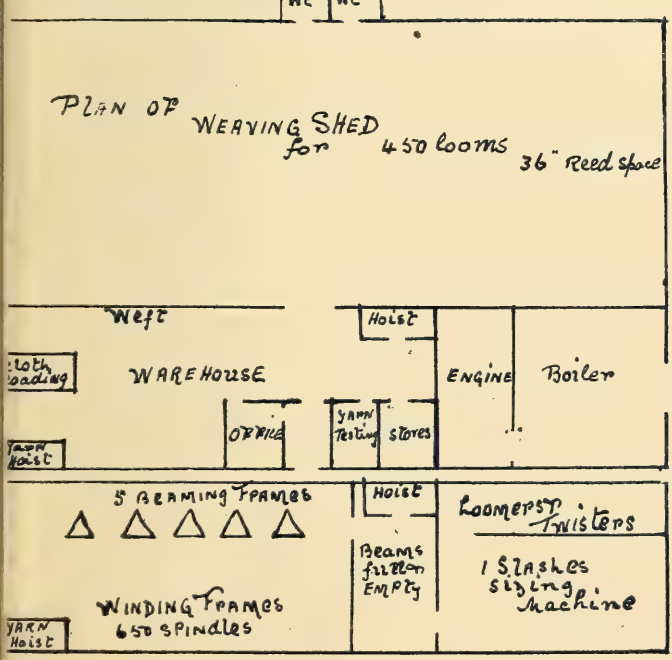
The above particulars allow an ample margin for variations.

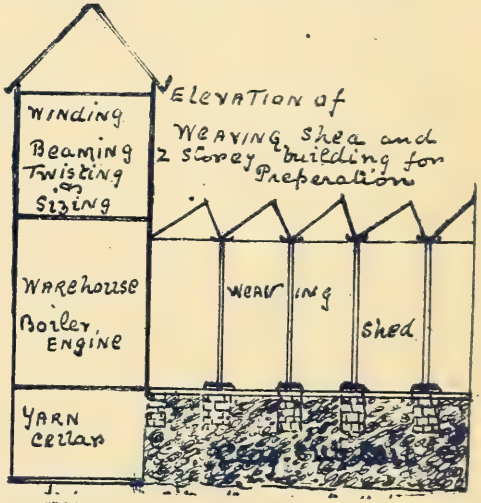
Buying & Selling

The business of buying and selling is conducted in the Manchester Exchange
The market days are Tuesdays & Fridays but business is done on other days of the week.
When a salesmen takes an order for cloth say 900 pieces

32- 116- 16- 16 32/50ˢ

he takes his price for yarn on the market price for the day. He adds 80% on weaving price to cover expenses, and then obtains as good a price above that, as he possibly can. If the order is taken he buy 8448 lbs warp yarn and 5670 lbs of weft yarn to cover it:





situation, protected from any winds, open to moist airs, near river, canal or good supply of water, roof windows to face the north. within easy access of Manchester, near railway, in a district where there is a suitable supply of labour — James Holmes —

-MOTIVE POWER-

Honours Weaving

"The transmission of motive power, the speed of main shafting., Size of Drums and pullies, and most suitable speeds for various kinds of looms."

On a basis of 1 I.H.P for 3 looms, the indicated H.P. of the engine required for 450 looms equals 450 ÷ 3 = 150 I.H.P. this will include driving of preparation machinery as well as looms, the driving for the seperate machines is given as follows.

cop winding frame 200 spindles 1·5 I.H.P. self stopping beamer three machines 1 I.H.P. Double Sizer with pumps 2·4 I.H.P. Slasher sizing machine 4·5 I.H.P. I have the data to respect to the following mills. No 1 mill 600 looms Engine 200 I.H.P. coal consumption 3 lbs of coal per I.H.P. per hour. No 2 mill 980 looms 40" reed space half of these looms have dobbies on I.H.P of engine 305: coal consumption 2½ to 2 lbs per hour per I.H.P. The average price of steam coal will run about 10/- per ton (1903).

It is usual in this district to let out room and power for running looms and to charge from 36/- to 38/- per year rent for one loom. This price included preparation machinery I have in mind a spinning and weaving mill the I.H.P of the engine is 560 and, if driving looms only 1680 looms can be driven 36" R.S. coal consumption 2½ to 3 lbs per I.H.P per hour. It was formerly the custom to work boilers at about 30 lbs per sq in. Steel boilers are now made to work at 120 to 160 lbs in the engines referred to of 560 I.H.P. there are two boilers working at 80 lbs pressure, the engine is a double beam with high and low pressure cylinders the advantage of this is, that when the steam has done its work in the high pressure cylinder, it passes to the low pressure cylinder and more work is got out of it, it is then condensed after leaving this cylinder, (in some types of engines there are three cylinders) The pressure in the boiler is always higher than the highest pressure on the piston as there is always a certain amount of loss takes place between the boiler and the engine, the steam pipes from the boiler to the engine ought to be well covered to prevent radiation

The particulars as taken from an indicator diagram from the above engine are given below

Right engine

High pressure cylinder	29½" dia	2 ft 7½"	Stroke.	mean effective pressure	56·25	I.H.P 152·9
Low " "	36¾ "	5 ft 3 "	"	" " "	13·72	" 129·7

Left engine

High Pressure cylinder	29½" dia	2 ft 7½"	Stroke.	mean effective pressure	48·34	141·2
Low " "	36¾" "	5 ft 3"	"	" " "	11·7	108·2
				working I. H. P =		538.

Speed 28 Revolutions per min.

To enable the student to work out the above calculation the following formula is given.

The mean effective pressure is obtained from the indicator diagram.

Then $\frac{P \times A \times N}{33000} = I.H.P.$ 33.000 is the number of units in I.H.P.

P means the mean average pressure on the piston throughout the Stroke
L " length of stroke in feet
A " area in square inches of cylinder or piston obtained thus dia² × ·7854
N " number of strokes per min. one revolution of crank = 2 strokes

Taking the working for the above Right engine low pressure cylinder

$$\frac{P \quad L \quad A \quad N}{13·72 \times 63 \text{ inches} \times 36·75 \times 36·75 \times ·7854 \times 28 \times 2} = 129.7 \text{ I.H.P.}$$
$$33000 \times 12 \text{ inches to 1 ft}$$

Assuming that the looms have to be driven at a speed of 210 picks per minute, which is a fair average speed, it will be advisable to have a 14 inch drum on the shafting driving a 8" pulley on the looms. Speed of Shafting 120 rev. per min. it will be necessary to put on

James Holme.

train of wheels together from the engine, so that the engine speed multiplied by the drivers, will equal the drivens multiplied together along with the speed of the loom example

ENGINE Calculation.

DRIVING Wheel ON ENGINE		Bevel Mitre Wheels		DRIVING DRUM		ENGINE STROKES per MIN.	
180 teeth	×	30 teeth	×	14" dia.	×	60	= 210
90 teeth	×	30 teeth	×	8	×	210	
DRIVEN Wheel FROM ENGINE		Bevel Mitre Wheel		loom Pulley		Picks per MIN. of loom.	

The above calculation does not account for any slip in the belt, the loom speed will be in actual practice 10% slower than 210 picks per min. Say 190.

If belt or rope driving is adopted throughout, then dias. of drums and pulleys must be taken in place of teeth in wheels. In the case of the mitre wheels, it is better for working if one wheel contains one more teeth than the other by this means, the same teeth only engage with each other at long intervals, also a 91 engaging with 180 will be better for the same reason.

Note the arrangement of the mitre wheels driving the line shafts they are not set one in the same direction

The diameters of the shafts are thickest nearest to the point where the power is received, diminishing in dia. the further they are removed. Steel shafting owing to its lightness will transmit 25% to 30% more power than wrought iron

The different forms of driving are Wheel Gearing and Rope Driving

In wheel gearing the motion is conveyed from one shaft to another through wheels, and a large driving wheel is fixed on the crank shaft of the engine. The great advantage of this system is that it is a positive drive, with practically no slip. The objections are the noise, liability to costly breakdowns, cost of greasing, it is also very dirty, all the wheels on the line shaft require to be covered in, the driving wheel from the engine requires constant watching, a broken tooth might mean a serious breakdown.

Rope Driving consists in having a grooved drum on the crank shaft of the engine, and by a series of ropes transmitting the power through grooved drums from one shaft to another, the strength of the ropes and the shape of the groove in the drums were at first serious drawbacks, but these have now been overcome. It is usual to make the drums with V shaped grooves in the rims, the most commonly accepted angle being that of 45° these grooves are of sufficient depth to prevent the rope bottoming or resting in the bottom of the groove, the object of this is to diminish the amount of slip. much can be said in favour of rope driving, it is cleaner, noiseless, easy of repair. the great drawback is the loss in slippage of the ropes.

The best method is a mixture of the two namely to employ a large leather belt to drive from the engine, employ bevel wheel gearing on the driving shafts, and the usual straps for driving the looms. many firms are adopting this course some of these large leather belts are expensive costing from £100 to £200 each by means of elbows, and pressers they are cemented on in working position

Speed of looms

Weaving Looms.	Pick.
Plain, tuvels and sateen tappet looms 36" to 40" Reed Space	220
Double lift dobbies " " " 190 to	200
" " " 18 to	190
Double lift jacquards with two cylinders	180
Single " " " one cylinder	160
Cross Border " " two cylinders	160
Leno Jacquard " Single lift one cylinder	140
Circular Box looms	190
Drop	180
Tappet and "Swivel" looms	130
Terry or Turkish Towel looms.	190
Automatic looms if the change cop or shuttle without any slowing down	190
" " if they slow down or stop to change	210

James Holmes

Fig 1- illustrates the spray system of humidifying the water is forced by special pumps at great pressure through small apertures and striking against a fixed surface it is broken up into an infinite number of small particles so as to humidify the surrounding atmosphere. The waste water is taken away by a waste water pipe, is filtered and used over again

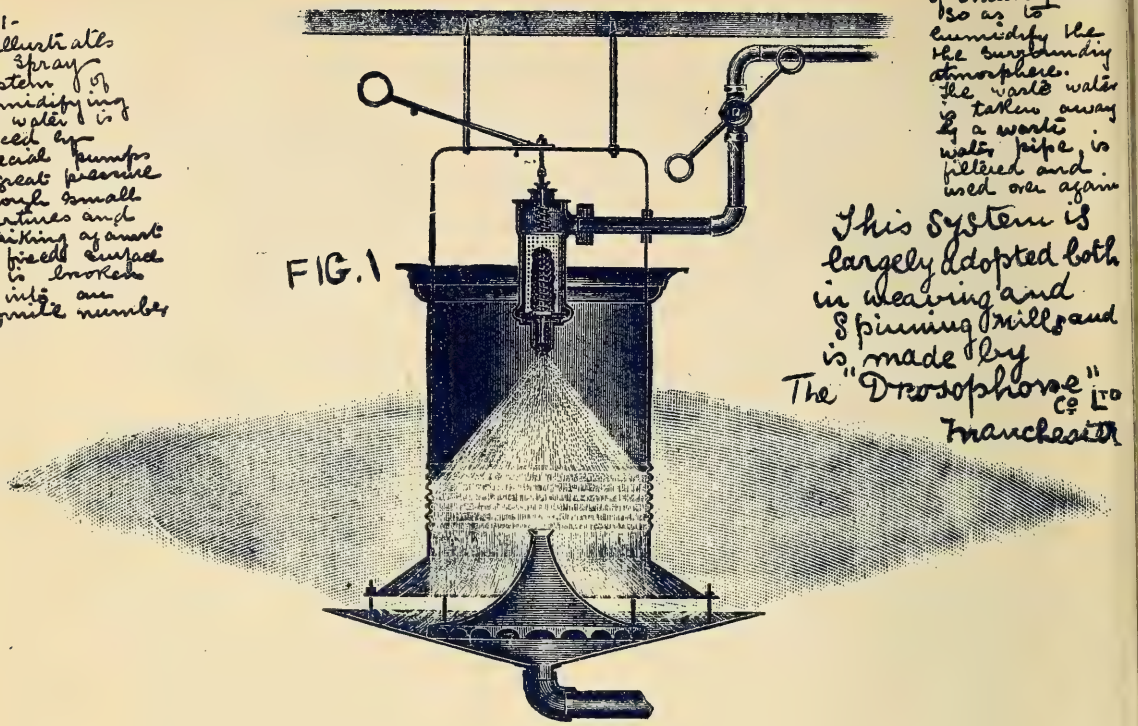


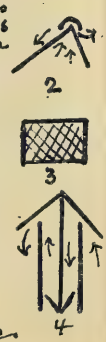
FIG. 1

This system is largely adopted both in Weaving and Spinning Mills and is made by The "Drosophore" Co Ltd Manchester

Mill Management. "The best and most economical forms of lighting, heating, ventilating and humidifying mill buildings"

VENTILATION. The amount of pure air required by each adult is 3000 cubic feet per hour. The space allowed for each weaver in a weaving shed, is sufficient to allow for this amount being supplied without producing a draught.

The air in a room is heated by the presence of persons. The warm air rises and the cold air rushes in, a constant supply is kept in the endeavour to keep the inner and the outer air at the same density, no particular arrangements are necessary only that there shall be communication between the two atmospheres. This is provided for in weaving sheds in several ways. ① The roof windows are open at their lower ends in such a manner as to admit fresh air or allow warm vitiated air to escape, but effectually prevents the entrance of rain or snow ② In some cases the roof tiles are set as ventilators, and openings are made in the highest point of the roof, these simple ridge openings are said to be the most effective in outlets in one storey buildings, ③ If there are side windows these may be provided with ventilators, lacking these perforated iron plates may be built into the wall near to the lower part of the roof (4) Sometimes natural ventilation is aided by the use of specially constructed ventilators fixed to the roof so constructed as to admit fresh and discharge foul air



WARMING is always carried out by the aid of steam pipes natural ventilation along with warming and lighting are all that is required in weaving sheds as the diffusion of the warm and cold air is sufficient to keep up the fresh air supply EXCEPTING when humidifiers are used, then fans are used for the extraction of the foul air, that is to say if fresh warm moist air is introduced by propulsion, fans must be used for Extraction. Daylight windows face north.

LIGHTING. This is generally by gas or electric lighting. Incandescent gas lights on the Welsbach principle have been lately introduced. They are far superior to ordinary gas and cheaper, there is a great wastage in mantles.

HUMIDITIERS. Cotton yarns work much better, and less breakages occur in warp ends during wet moist weather than during dry weather, as the former conditions do not obtain throughout the

James Holmes

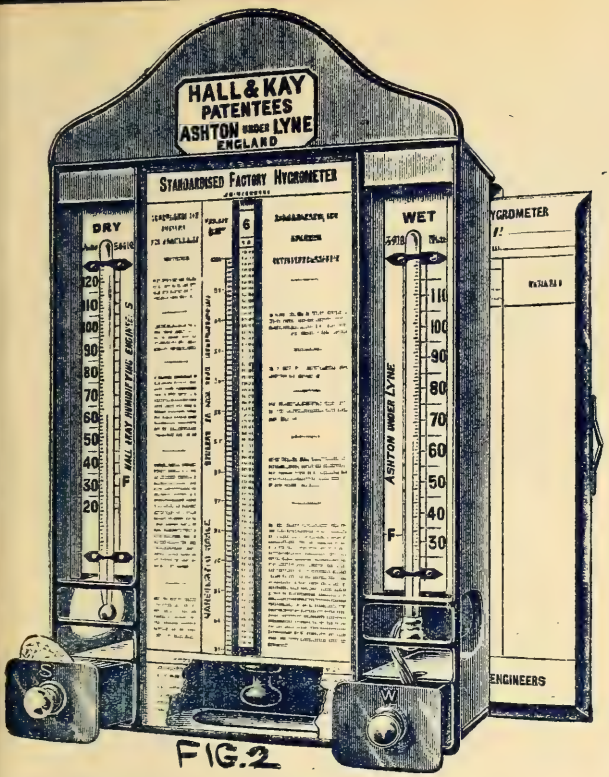


FIG. 2

year in this country, artificial means are employed to produce these conditions, in the form of Humidifiers. There are arrangements for introducing warm or cold moist air into the shed. The one shown in fig 3 is made by James Howarth of Farnworth and is a very good one. A is a fan by which air is drawn down a trunk B from the open air, through the chest C in which are steam or water coils, thence forcing it through the Humidifier D and into the room or rooms to be ventilated, distributing the same at different points by tubes on which are placed revolving distributors. The air in its passage through the Humidifier D is forced through a perforated plate or tray E on which a film of hot or cold water is maintained by which process it becomes hot, cold or moist air as desired. In the chest C and Humidifier D are coils of tubes F communicating with each other thro. these coils cold water runs when cold air is required, or steam when hot air is required & are plates in chest C by means of which air is conducted thro the compartments and deflected upon coils F by which a Dealer degree degree of heat or cold is attained. 1. 2. 3 and 4 are valves for regulating the supply of steam or water. 6 Waste valve 7 overflow tube

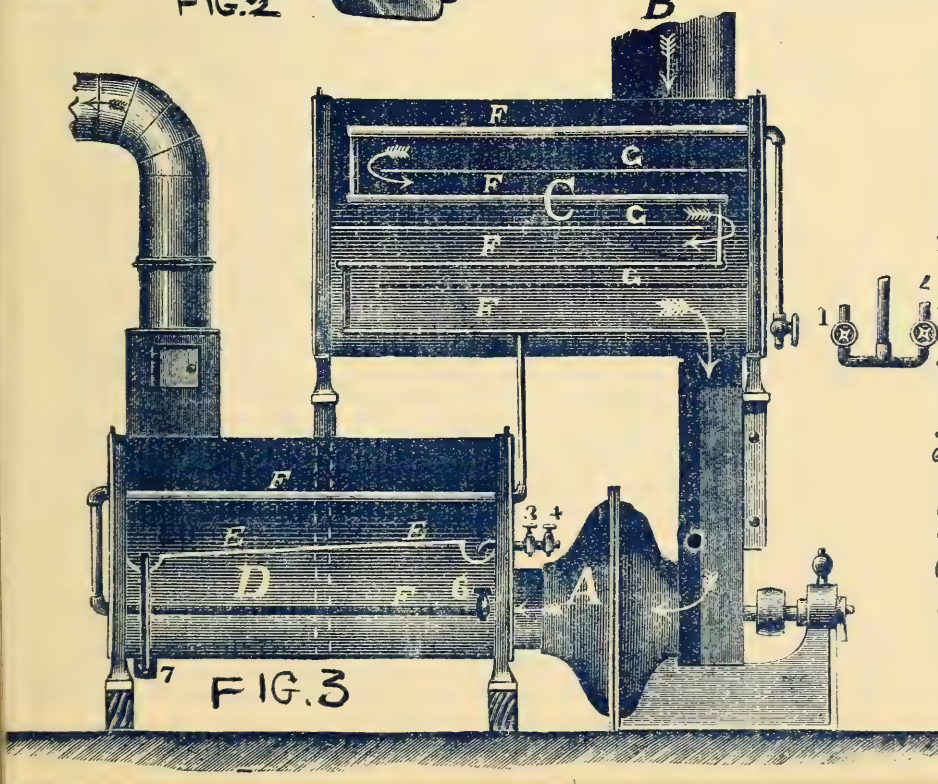
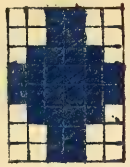


FIG. 3

Fig 2 illustrates an instrument used for registering the amount of moisture present in known as

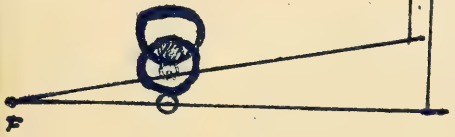
Hygrometer made by Hall & Kay of Ashton under Lyne they are also makers of Humidifiers. It consists of two thermometers graduated alike, the bulb of one is covered with a thin layer of muslin, connected by a strand of cotton to a cup of water, the wet bulb registers a lower temp. than the dry bulb: the nearer the two readings are together the greater the amt of moisture

James Holmes



A

The SKetch to the right shows the needle frame moved horizontally by a pair of Cappels the distance thro which it can move is regulated by the grope in the Cappels wheel. The pattern on the wheel is cut to suit pattern A



In some kinds of patterns as in detached spots situated some distance apart, the needle frame is inoperative for many picks; In other cases where more than one needle frame is at work each frame may require to be put in and out of action many times in one revolution of the wheel. this is provided for by means of suspended levers fixed in front of the loom, shown in the

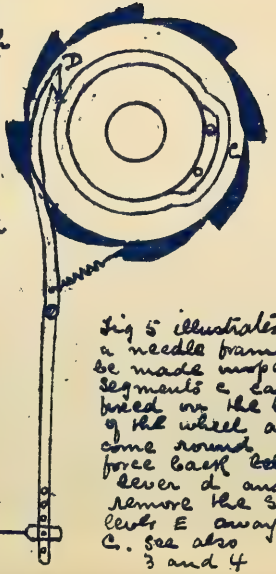


illustration of the loom. and in detail in figs 3. 4. and 5.
The pins A figs 3. 4 which forms the false reed are lifted on each pick. The needle frames fall with their own weights and they are lifted into the shed by means of levers fixed to the swing rail of the loom. In figs 3. 4 a rod g connected with the needle frame is fixed to the end of the lever D centred at H. when beating up takes place the needle frame and levers assume the position as shown in fig 3. when the slay is thrown back and the shuttle moving across the loom the parts assume the position shown in fig 4. the suspended lever E resting over g forces the needle frames upward

fig 5

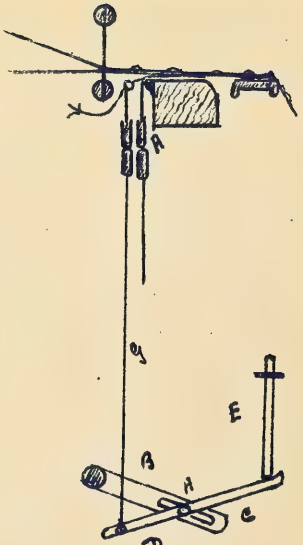
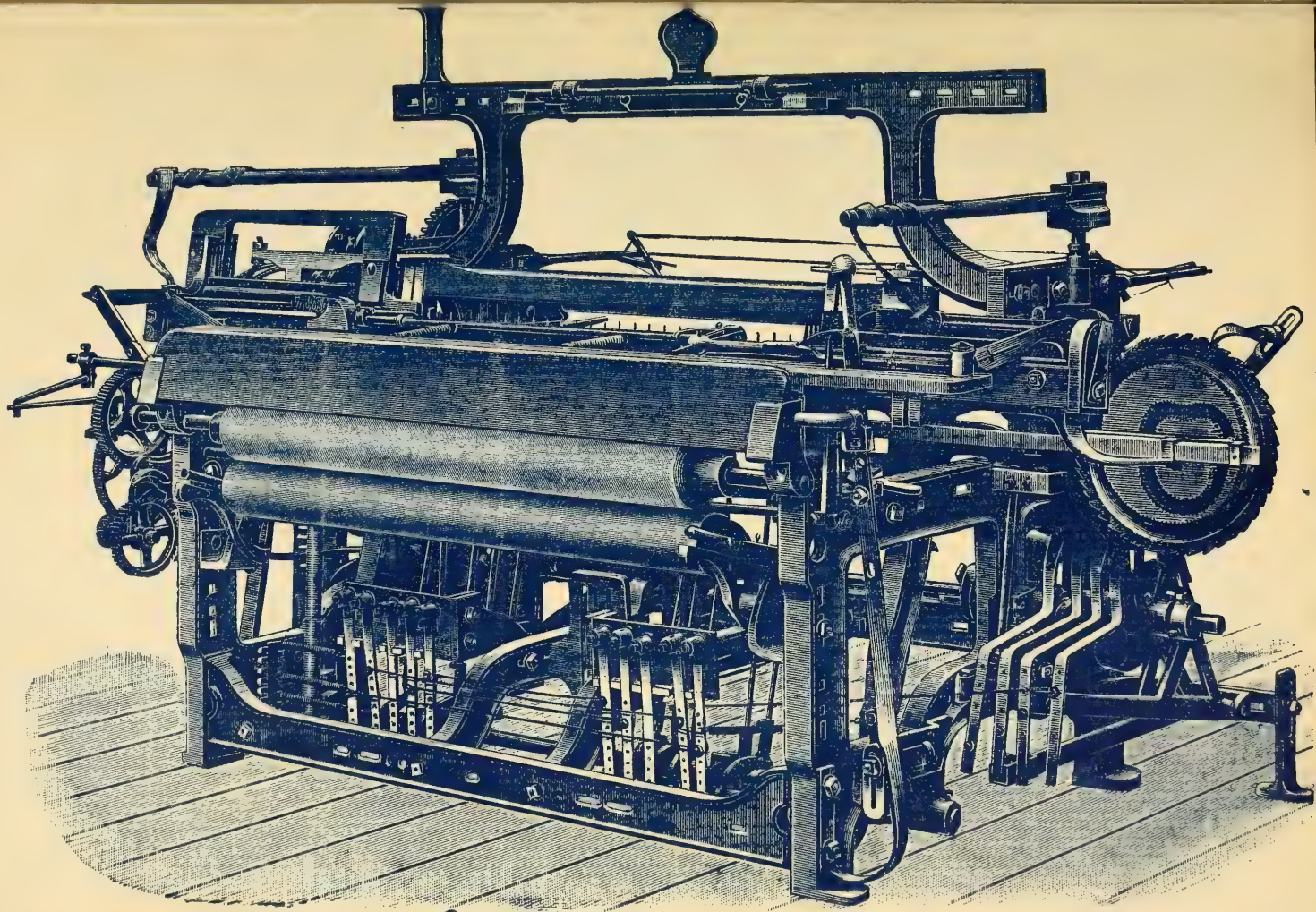


fig 3

fig 4

Fig 5 illustrates how a needle frame can be made inoperative. Segments c can be fixed on the back of the wheel as these come round they force back both lever d and remove the suspended lever E away from C. See also figs 3 and 4

James Holmes.



The above illustration shows a LAPPET LOOM. Lappet weaving consists in the ornamentation of a cloth by means of extra figuring warp ends, that interweave with the cloth on the face of embroidery. The threads are drawn thro needles fixed to a frame and situated in front of the reed the needle frame is given a lateral motion, the distance thro which it can move is controlled by a groove cut into the face of a wood wheel called a Lappet wheel. Holmes.
James

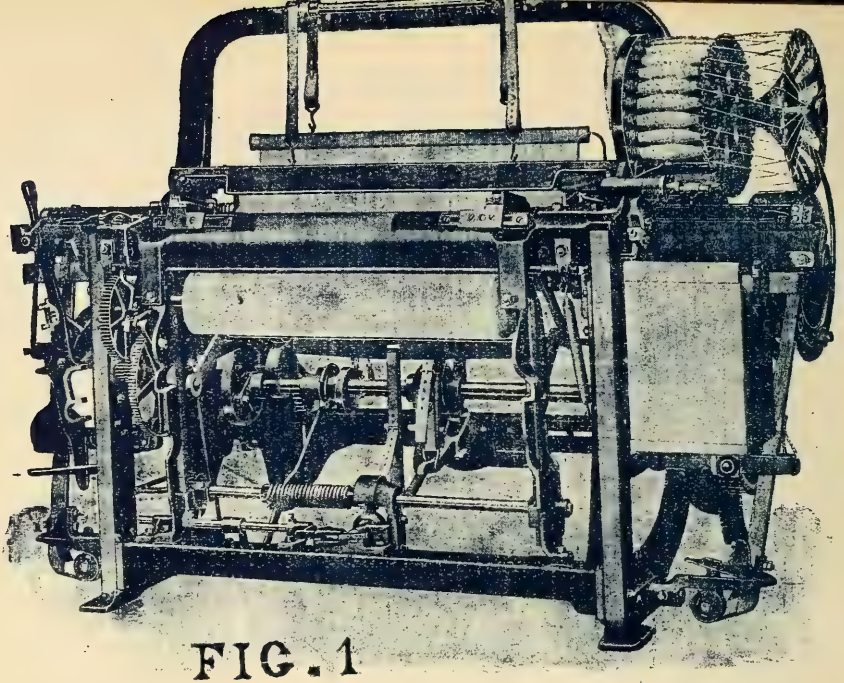


FIG. 1

The Northrop Loom.-

In the Offices of the British Northrop Co Ltd Manchester I saw a loom 45" reed space running 160 picks per minute. There can be no objections to running at a higher speed with the loom placed on a solid floor and under more favourable conditions

How it differs from an ordinary plain loom.

Although the operation of weaving in the same as in plain looms, the means adopted is different in many respects to our English ideas of weaving.

Crank Shaft. In the 1st place the crank shaft revolves in the contrary direction the picking takes place with the crank on the top: the heads bent level when the crank is on the bottom, this is an advantage to the weaver when taking ends up, the usual method is to have the heads level with the crank in the top. the weaver generally puts the brake on to prevent the slay from falling back with its own weight

The Picking is a combination of the overpick and underpick. There is the usual picking tappet, nose-bit and picking bowl on an overpick loom which causes a gradual preparation or tightening of the picking bands but the usual upright shaft to which the picking bowl is fixed lies horizontally with the loom side and by means of a short bracket and picking bands is connected with the picking-stick of an underpick loom, this dispenses with the usual picking bands and spindles, and ensures a much cleaner action as there is less liability for oil, grease or dirt to be known into the cloth.

The Take up Motion. The regulation of the picks per inch is worked from a train of wheels, and a catch operated from the rocking rail, the train of wheels are fixed inside the loom framing and occupy only a small space the wheels work out to suit a pick per tooth for the change wheels so that a wheel 20 teeth gives 10 picks per ¼ inch this enable the attendant to know at once the proper wheels to use for any pick

The warp let-off motion is positive and is regulated by a feeler lever which rests on the yarn of the warp beam, there is a rack wheel and pushing catch as in an ordinary take up motion, as the diameter of the beam becomes less the feeler resting on the beam operates a lever which alters the position of the pushing catch causing it to take a larger sweep and take up more teeth and so turns the beam quicker on account of the diminishing time diameter, say in a full beam the catch will only take up one tooth at a time when the diameter has lessened a few inches the catch will take up 2 or 3 teeth. To ensure its more perfect working the back rest over which the warp passes acts as a regulator, the tightening of the warp lowers the back rest this action compresses a spiral spring which causes the pushing catch to take a little larger sweep and so let off a little more than the normal position

James Holmes

The High Roll Take up Motion. Fig 2

The roller is made of iron to prevent shrinkage as in the illustration is shown a full cloth roller 18" dia. when this size of roller has been attained it is removed bodily from the loom and carried to the warehouse and inspected from the roll, an empty roller taking the place of the full one. a small hand wheel engaging with worms and worm wheel enables the cloth roller to be let down for pulling of the cloth for inspection if need be. The generally adopted principle in this country is the lifting up of the weight levers and pulling off the cloth every 11 to 15 yards.

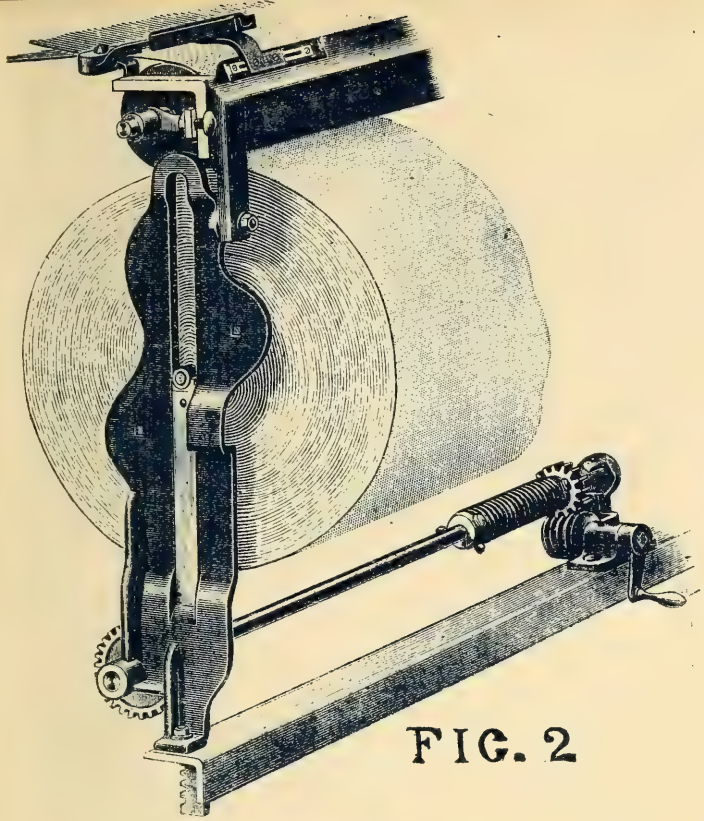


FIG. 2

The above mentioned parts are only additions or alterations from the ordinary loom.

The weft changing mechanism is the part which claims the most attention

fixed to the front of the loom, (not to the slay) is a large circular hopper capable of holding 25 cops The hopper is shown fixed to loom in fig 1, a more full and detailed view is shown in fig 3

The cops are placed on shuttle pegs fig 4, the pegs have a round end of wood covered with two or three coils of wire, this enables the weaver to firmly grip the peg when skewering the cop, the cops when skewered are placed in the hopper and held in position by spring clips. The only motion of the hopper is circular, and each time the weft is beaten up to the fell of the cloth the shuttles box is brought directly under the lowest cop in the hopper. Wood pins can be used instead of cops.

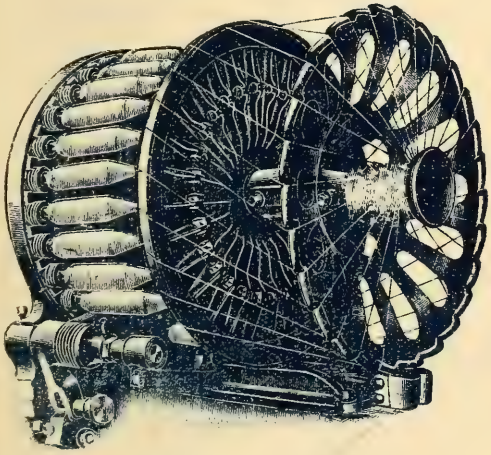


FIG. 3

The weft fork is of the usual type, but the tappet on the bottom shaft for working the weft fork hammer is of much longer dwell than on an ordinary loom

FIG. 4

The Shuttle. Fig 5

The shuttle peg is held in the shuttle at the wire covered end by means of spring clips which hold it quite firm and steady in position, the peg is removable bodily and by pressing firmly against it, it can be pushed out the bottom of the shuttle

James Holmes

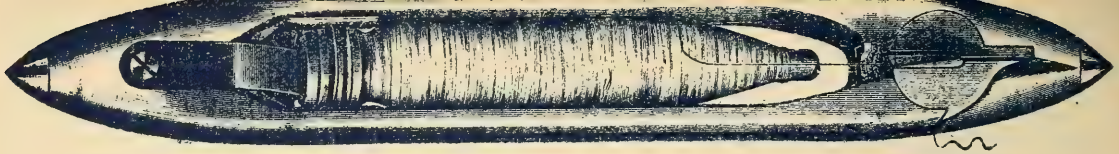


FIG. 5

In the above illustration of a shuttle a wood pirn is shown in place to accomplish this there is a groove in the cop. The shuttles are set threading of its length into which the weft in the direction of the shuttle moves along this groove is turned towards the shuttle as the shuttle moves along this so that on the second pick the shuttle is completely threaded

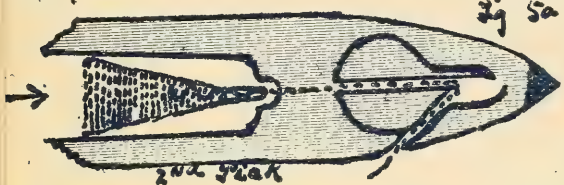


Fig 5a

2nd pick

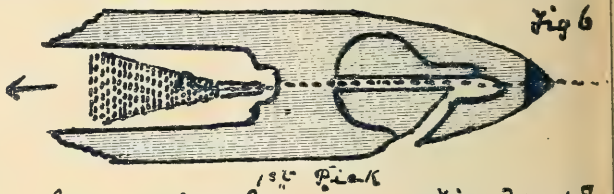


Fig 6

1st pick

The connection of the weft fork to the change mechanism. Figs 7 and 8

connected to the weft fork holder A is a lever B this lever is fixed to a rod C which extends across the front of the loom

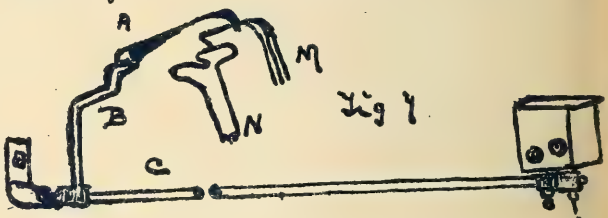


Fig 7

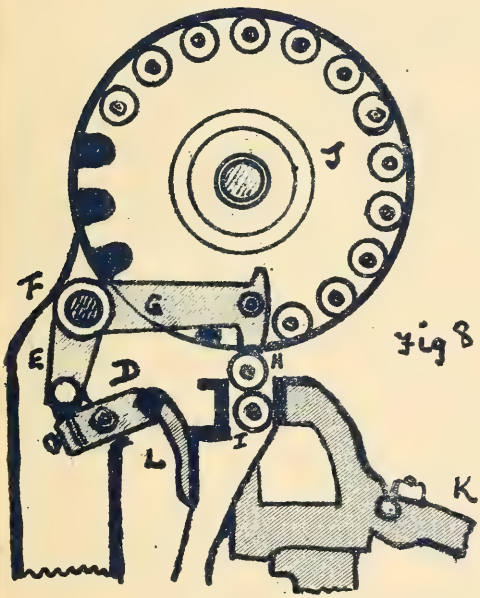


Fig 8

at the rod C are connections with the short lever D Fig 8 which when the loom is running is dropped down D is connected and forms part of a bell crank lever E G with its fulcrum at F, the other end of G rests above the bottom cop H in the hopper J The above mentioned parts are fixed to the breast beam of the loom. I is the shuttle in the box K the crank arm fixed to the front of the shuttle box on the change side of the loom is a short stud L

Its action is both simple and rapid. When the weft fork acts and indicates the weft broken or spent the weft fork M Fig 7. remains down and is pulled forward by the hammer lever N this pulling forward of the weft fork operates the lever B turns the rod C part of which round and lifts up the short lever D Fig 8 so that when the slay comes forward the stud L fixed to the front of the box strikes D and operates the bell crank lever E G (the cop shuttle) forcing the cop in the hopper at this moment directly over the cop in the shuttle to take the place of the spent cop, the latter falling to the shuttle to take the place of a cop standing at the side of through the bottom of the box into the loom.

If the shuttle fails to enter the box at the proper time, or if the shuttle is not sent far enough into the box so as to permit the shuttle peg in the shuttle a feeler lever feels in to rest direct over the shuttle peg in the shuttle, a feeler lever feels in front of the shuttle box and if the shuttle anyways projects and is not

James Holmes.

still full into the box, the feeler prevents the change lever D from coming into contact with the slide b fig 8 and no change takes place on the next pick the loom knocks off as in all fast reed looms.
In the illustration fig 8 the entering cop skewer has just started the pressure that expels the one in the shuttle, it has still to move some distance, the expelled skewer is not empty in this instance, as it illustrates a case in which the weft broke while weaving 4

Adjustments

If any part become worn so that when beating up takes place the shuttle box is not brought into the correct position for change, the crank pin which secures the crank arm to the slay sword is made eccentric ◉ and by giving it a slight turn the slay can be brought a little further forward or put a little further back at the time of beat up, likewise if the swell projects too far through the shuttle box, the pin on which it works is eccentric, and by turning it a little any desired position of the swell and consequent position in the box of the shuttle can be obtained

Selvege-Temples and Weft Cutter

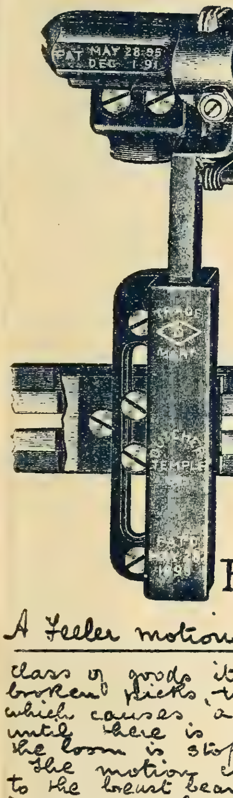


FIG 9

Fig 9 When a new cop is put in by the change mechanism the free end of it is connected to the hopper, on the first pick the weft is caught by a pair of clips and held tight, the temples are provided with a pair of nippers fig 9 which open and close on each pick the necessary motion being given to them by the slay when beating up takes place, when the reed comes to the fell of the cloth the nippers seize and cut the weft within a quarter of an inch from the selvege, the loose end attached to the hopper is drawn away by the revolving of the latter

Warp Stop Motion fig 10

Each thread of warp supports a wire heald through which the thread passes, these wire healds are thread upon a stave, the lifting of the stave operates the healds in the usual way. The slot at the upper part of the heald fig is longer than the depth of the heald stave passing through it, so that in the act of shedding for some part of its course the wire heald is suspended by the thread drawn through it, beneath the healds is a vibrating bar worked from the bottom shaft and indirectly connected with the stop motion of the loom, if a thread breaks the heald through which it is drawn drops down and prevents the bar from vibrating, this causes a projection on the bottom shaft to operate the stop motion, and stop the loom in three picks

FIG.10

A Feeler motion to change the cop before the weft breaks

In some class of goods it is of the utmost importance that there must be no broken picks, to meet these cases a feeler motion is introduced which causes a change to take place when the weft has run off until there is only a small cop bottom left, if the weft breaks the loom is stopped by the weft fork in the usual way.
The motion consists of a lever about 12" long fixed to the breast beam of the loom, a slot about 2½" long is cut in the front of the box, and a similiar slot in front of the shuttle, when beating up takes place, one end of the feeler lever B enters the box and feels for the cop if there is a full cop the lever is forced back and the other end of the lever prevents the weft fork hammer from striking a lever connected to the rod C fig 7. when the cop is reduced in size to a small cop bottom the feeler lever enters further into the box the other end of the lever allows the weft fork lever to strike the lever connected with C fig 7 and a change of the cop takes place. The mechanism can be easily regulated to change for any size of cop bottom

Conclusion

I have examined cloth made on these looms and I find it with the broken pick preventor, more perfect, than cloth made under the usual conditions; without the feeler motion the cloth is equal to any plain cloth produced by the ordinary loom.
The above observations are my own. I refrain from saying anything about the numbers of looms a weaver can run, but I have no doubt that the makers are justified in all the statements they make.

James Holmes